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JOURNAL  
OF  
THE PROCEEDINGS  
OF  
THE LINNEAN SOCIETY.

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ZOOLOGY.

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VOL. II.

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PROCEEDINGS  
OF THE  
LINNEAN SOCIETY OF LONDON.

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November 4th, 1856.

Thomas Bell, Esq., President, in the Chair.

The Meeting having been specially summoned for the Election of a Member of Council and of a Treasurer in the place of William Yarrell, Esq., deceased, William Baird, Esq., M.D., was elected into the Council, and Francis Boott, Esq., M.D., was elected Treasurer.

The President nominated William Wilson Saunders, Esq., to be a Vice-President, in the place of William Yarrell, Esq., during the remainder of the present year.

A Resolution of the Council, of the 23rd of October, to the following effect, having been communicated to the Meeting, it was unanimously resolved: "That on this, the first occasion of its meeting since the death of the late Treasurer, William Yarrell, Esq., the Society is desirous of entering on its Minutes an expression of the high sense which it entertains of the personal qualities of that gentleman, of his extensive zoological attainments, and of the services rendered by him to the Society during a long period of Fellowship, and especially during the eight years of his Treasurership; as also of its deep regret at the loss of a colleague so amiable and estimable, and so warmly attached to the interests of the Society."

Amos Beardsley, Esq., was elected a Fellow.

Read, first, a Paper "On some Entomogenous *Sphæriæ*;" by the Rev. M. J. Berkeley, M.A., F.L.S. (See "Botanical Proceedings," vol. i. p. 157.)

Read, secondly, a "Note on *Sphærobolus stellatus*;" by the Rev. Henry H. Higgins; communicated by the President.

Read, thirdly, a "Description of the Kobo-tree, a new genus of *Leguminosæ*, collected by Dr. W. F. Daniell, F.L.S., in Sierra Leone;" by John J. Bennett, Esq., F.R.S., Sec. L.S. (See "Botanical Proceedings," vol. i. p. 149.)

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November 18th, 1856.

Thomas Bell, Esq., President, in the Chair.

Read, first, an Extract from a Letter from the Rev. J. M. Rodwell, communicated by Dr. Iliff, F.L.S., noticing the occurrence of several rare *Fungi* in the neighbourhood of London, during the present year.

Read, secondly, a "Description of a new species of *Draparnaldia*, from the New Forest, Hampshire;" by John Braxted Hicks, Esq., M.D., F.L.S. (See "Botanical Proceedings," vol. i. p. 192.)

Read, thirdly, a Note "On the Palm-tree of Timbuctoo;" by Berthold Seemann, Esq., Ph.D., F.L.S. (See "Botanical Proceedings," vol. i. p. 152.)

Read, fourthly, a "Notice of some Monstrosities in semi-double flowers of *Saponaria officinalis*, L.;" by Maxwell T. Masters, Esq.; communicated by the Secretary. (See "Botanical Proceedings," vol. i. p. 159.)

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December 2nd, 1856.

Thomas Bell, Esq., President, in the Chair.

John Ball, Esq., M.P.; William B. Carpenter, Esq., M.D.; John Garland, Esq.; R. S. Hill, Esq., and W. H. Holdsworth, Esq., were elected Fellows.

Read, first, a Paper "On a New Form of Corynoid Polypes;" by Philip Henry Gosse, Esq., F.R.S., A.L.S. (See "Transactions," vol. xxii. p. 113.)

Read, secondly, a "Note on the African species of Copal;" by Thomas C. Archer, Esq.; communicated by the President. (See "Botanical Proceedings," vol. i. p. 151.)

Read, thirdly, a "Note respecting certain glandular Appendages of the leaves in the autumn rosettes of *Epilobium montanum*;" by Daniel Oliver, jun., Esq., F.L.S. (See "Botanical Proceedings," vol. i. p. 190.)

Read, fourthly, the commencement of a Memoir "On the Phænomena of Torpidity and the production of fat in Hybernating Animals;" by G. Calvert Holland, Esq., M.D.; communicated by the Secretary.

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December 16th, 1856.

Thomas Bell, Esq., President, in the Chair.

The Rev. Charles Kingsley, A.M., and G. H. Kingsley, Esq., M.D., were elected Fellows.

Read, first, a Paper "On a species of *Pilobolus*;" by Frederick Currey, Esq., M.A., F.L.S. (See "Botanical Proceedings," vol. i. p. 162.)

Read, secondly, the conclusion of Dr. G. Calvert Holland's Memoir "On the Phænomena of Torpidity," &c., commenced at the last Meeting.

Read, thirdly, a "Note on the use of the Rhizoma of *Pteris aquilina*, L., as an Article of Food;" by the Rev. M. J. Berkeley, M.A., F.L.S. (See "Botanical Proceedings," vol. i. p. 156.)

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January 20th, 1857.

Thomas Bell, Esq., President, in the Chair.

Major-General Edward Sabine, R.A.; Charles Wentworth Dilke, Esq.; William Vernon Guise, Esq.; William Henry

Harvey, Esq., M.D.; Andrew Sinclair, Esq., M.D., R.N.; and G. H. Polyblank, Esq., were elected Fellows.

Read, first, a "Notice of the Mechanism of the Stomach of the *Crustacea*;" by T. H. Huxley, Esq., F.R.S.; communicated by Joseph Hooker, Esq., M.D., F.R.S., F.L.S.

Read, secondly, a "Note on *Spiranthes gemmipara*;" by Prof. Lindley, F.R.S., F.L.S. (See "Botanical Proceedings," vol. i. p. 168.)

Read, thirdly, "Contributions to Indian Orchidology, No. I.;" by Prof. Lindley, F.R.S., F.L.S. (See "Botanical Proceedings," vol. i. p. 170.)

Read, fourthly, a "Note on the Exhibition of *Fungi* in Cases;" by the Rev. H. H. Higgins; communicated by N. B. Ward, Esq., F.L.S.

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February 3rd, 1857.

Francis Boott, Esq., M.D., V.P., in the Chair.

Alexander H. Haliday, Esq., M.A.; John Eliot Howard, Esq.; and E. J. Lowe, Esq., were elected Fellows.

Mr. Bentham, F.L.S., exhibited specimens of various kinds of Jacaranda, or Rose-woods, sent from Rio Janeiro by Prof. Alemão, and made some observations upon them.

Read, first, a "Description of a new European species of *Paussus*;" by J. O. Westwood, Esq., F.L.S.

Read, secondly, a "Description of a new species of *Pulex* (*P. Imperator*, Westw.) found in a bedstead at Gateshead;" by J. O. Westwood, Esq., F.L.S.

Read, thirdly, a "Note on the Cultivation of Mosses;" by the Rev. H. H. Higgins; communicated by N. B. Ward, Esq., F.L.S. (See "Botanical Proceedings," vol. ii. p. 44.)

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February 17th, 1857.

Thomas Bell, Esq., President, in the Chair.

Vaughan Henry Alexander Holberton, Esq., was elected a Fellow.

Read, first, a "Note on the so-called perforations of *Rhyncnella*;" by W. B. Carpenter, Esq., M.D., F.R.S., F.L.S.

Read, secondly, "Description of a new species of *Euplectella* (*E. Cucumer*, Owen);" by Prof. Owen, F.R.S., F.L.S. (See "Transactions," vol. xxii. p. 117.)

Read, thirdly, the commencement of a Memoir "On the Characters, Principles of Division, and Primary Groups of the Class *Mammalia*;" by Prof. Owen, F.R.S., F.L.S. &c. (See "Zoological Proceedings," vol. ii. p. 1.)

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March 3rd, 1857.

Thomas Bell, Esq., President, in the Chair.

Alfred Newton, Esq., M.A., and the Rev. Henry B. Tristram, M.A., were elected Fellows.

Mr. Bentham, F.L.S., exhibited a specimen of *Orchis pyramidalis*, L., in which every flower of the spike was entirely destitute of spur; and also a specimen of *Cardamine hirsuta*, L., transmitted to him by Miss Llewellyn of Penllergare, in which the leaves had become proliferous. (See "Botanical Proceedings," vol. ii. p. 53.)

Read, first, a "Synopsis of the genus *Clitoria*, L.;" by George Bentham, Esq., F.L.S. (See "Botanical Proceedings," vol. ii. p. 33.)

Read, secondly, the first of a series of Papers, entitled "Præcursores ad Floram Indicam;" by J. D. Hooker, Esq., M.D., F.R.S., F.L.S., and T. Thomson, Esq., M.D., F.R.S., F.L.S. (See "Botanical Proceedings," vol. ii. p. 1.)

Read, thirdly, a Note "On the Principles of Generic Nomenclature in Botany;" by George Bentham, Esq., F.L.S. (See "Botanical Proceedings," vol. ii. p. 30.)

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March 17th, 1857.

Thomas Bell, Esq., President, in the Chair.

Henry Barth, Esq., LL.D., and John Quekett, Esq., were elected Fellows.

Read, first, a "Notice of a new species of Strepsipterous Insect found on a Homopterous Insect sent from Borneo by Mr. Wallace;" by J. O. Westwood, Esq., F.L.S.

Read, secondly, a Memoir "On the Germination of *Barringtonia* and *Careya*;" by Thomas Thomson, Esq., M.D., F.R.S., F.L.S. (See "Botanical Proceedings," vol. ii. p. 47.)

Read, thirdly, a "Description of a new species of Naked-eyed *Medusa* (*Thaumantias achroa*), with histological details;" by T. S. Cobbold, Esq., M.D.; communicated by the Secretary. (See "Zoological Proceedings," vol. ii. p. 38.)

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April 7th, 1857.

Thomas Bell, Esq., President, in the Chair.

John Edward Gray, Esq., Ph.D.; T. S. Cobbold, Esq., M.D.; and Walter Fitch, Esq., were elected Fellows.

Read, first, a "Note on a singular case of Colouring of the Human Hair;" by William A. Guy, Esq., M.B.; communicated by the President. (See "Zoological Proceedings," vol. ii. p. 41.)

Read, secondly, a Memoir "On the Dentition of the *Salmonidæ*, with Observations on the relation of Species to Genus or Natural Family;" by Robert Knox, Esq., M.D., F.R.S.E.; communicated by the Secretary.

Read, thirdly, "Notes on the Food of some Freshwater Fishes, more particularly the Vendace and the Trout, of the *Salmonidæ*;" by William Baird, Esq., M.D., F.L.S.

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April 21st, 1857.

Thomas Bell, Esq., President, in the Chair.

The following alteration in the Bye-Laws, proposed by the Council on the 17th of March, viz.

“That in Chapter XIII. Section 1, wherever the word ‘Tuesday’ occurs, the word ‘Thursday’ be substituted in its place,”

having been hung up in the common Meeting-room of the Society, and read by the President at the two last successive General Meetings, was put to the ballot and confirmed by the Fellows.

The effect of this alteration is to change the days of the Society’s Meetings from the first and third Tuesdays to the first and third Thursdays of the month.

Read, the conclusion of Prof. Owen’s Memoir “On the Classification of the *Mammalia*,” commenced on the 17th of February. (See “Zoological Proceedings,” vol. ii. p. 1.)

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May 5th, 1857.

Thomas Bell, Esq., President, in the Chair.

George David Pollock, Esq., was elected a Fellow, and Prof. J. Van der Hoeven and Dr. Charles Frederic Meisner, Foreign Members.

Read, first, a Memoir “On two new Genera of Brazilian Plants;” by George Bentham, Esq., F.L.S. (See “Transactions,” vol. ii. p. 125.)

Read, secondly, a Paper “On the Classification of the Warm-blooded *Vertebralia*,” by William M’Donald, Esq., M.D., F.L.S.

Read, thirdly, a “Note on some Supraseriferous Ferns;” by Thomas Moore, Esq., F.L.S. (See “Botanical Proceedings,” vol. ii.)

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May 25th, 1857.

*Anniversary Meeting.*

Thomas Bell, Esq., President, in the Chair.

This day, the Anniversary of the birth of Linnæus having fallen on a Sunday, being the day appointed by the Charter for the Election of Council and Officers, the President opened the business of the Meeting with the following Address :—

GENTLEMEN,

It will be reasonably expected that on an occasion so interesting as the present, and so auspicious as regards the future prospects of the Society, my annual Address to the Fellows should have a particular reference to the important change which has taken place in our position, and that my very earliest expressions on again meeting you should be those of pleasure and congratulation. Removed as we now are finally, from a home, where, for thirty-six years, we have met together as a Society, in the most friendly and united spirit, joining in the promulgation of the truths of nature, in the investigation of her phænomena, and the establishment of her laws, with a zeal which, I may unreservedly say, has never overstepped the limits of a friendly rivalry, it is natural that some feelings of regret should be experienced by at least the older members of our body, at our emigration from an abode associated with so many pleasant reminiscences, and so much instruction in our favourite pursuits,—that the place where many friendships have been formed, and still more, in connexion with which many ties of intimacy and affection have been broken by death, which alone could have broken them,—where so many of us have found their taste for natural science excited or developed, their doubts solved, or their ignorance dispelled by friendly intercourse,—should be remembered with feelings of attachment and regret, and that our recollections should long hover round the pleasant haunts where the love of nature has been fostered and its science cultivated, without any of those countervailing elements which too often interfere with the peace and harmony which legitimately belong to such pursuits.

But there are other considerations which may well counterbalance any such reflections as these, and allow us to take possession of our new abode, if not with unmixed, yet with prevailing thankfulness and gratification.

It will probably be in the recollection of some now present, that upon the first occasion on which I ventured to break through the

silence with which it was previously the custom for the President to meet the Fellows of the Society on their Anniversary, I took occasion to remark, that "it may be useful as well as pleasant to stand still, as it were, from time to time, and mark the improvements which have attended our progress, and, in our own case particularly, to watch the results of the influence which this Society ought to exercise, and doubtless *does* exercise upon the advancement and diffusion of natural knowledge;"—and if such a distinct recognition of our progress be desirable on ordinary occasions, when we have only to mark the regular return of the season of our official duties, it is still more interesting and incumbent upon us to note any such important epoch in our associated existence, as that which this day inaugurates our establishment in a new and more commodious domicile, and under circumstances far more propitious in some respects than any which we have hitherto enjoyed. I have therefore thought this a fitting occasion on which to cast our eyes back through the vista of our many years of existence, and endeavour to gather from the retrospect some elements of satisfaction at our past doings, of congratulation upon our present condition, and of hope for our future prospects.

It has been observed with much truth, by the amiable biographer and widow of our founder, that whilst "the literary institutions and learned academies of Europe have generally owed their origin and success either to large endowments, to royal favour, or to the commanding influence of persons already known by their scientific attainments or their station,—this Society is almost a solitary example of an institution deriving its origin from an individual, young and unknown to fame, without rank, without wealth, without support, whose ardour in the pursuit of science led him to risk the expectation of a moderate independence, by bringing into his native country, at the expense of his patrimony, those rich materials for which princes had contended, and upon which he was to establish a new Society, and give to it its name, its character, and direction\*;"—for we learn from the same source of information, that the establishment of this new Society had been projected by Sir James Smith and several of his scientific friends, with the view of rendering his possession of the cabinets and library of Linnæus subservient to the general use of the cultivators of Natural Science.

We owe then the foundation and present existence of the Lin-

\* Memoirs and Correspondence of the late Sir J. E. Smith, edited by Lady Smith, vol. i. p. 341.

nean Society to the happy enthusiasm of a youthful naturalist, who with a love of Natural History amounting to a passion, and with a rare devotion of the mind to one great and absorbing object, determined to effect the acquisition of a priceless treasure in the collections I have alluded to, and which are now happily secured within these walls, and occupy the place of honour in a room well-worthy of their reception,—our new and splendid library.

You are all doubtless well-aware of many of the circumstances connected with this remarkable result of combined resolution, enthusiasm and tact; but I shall be pardoned a moment's reference to that event as highly interesting in itself, and as the point upon which, as I before observed, the institution of the Linnean Society undoubtedly turned.

It was then at the close of the year 1783, when James Edward Smith, still a student of medicine, was exactly twenty-four years of age, and shortly after the death of the younger Linnæus, that our founder happened to be breakfasting with Sir Joseph Banks, then President of the Royal Society, who informed him that he had received from Dr. Acrel, the Professor of Medicine at Upsal, the offer of the whole of the collections and library of the great Linnæus and of his son,—the Books, MSS., and Natural History,—for the sum of 1000 guineas. Sir Joseph stated that he should decline the offer, but strongly recommended his young friend to become the purchaser. In pursuance of this advice, which met a ready response in his own ardent inclination, he immediately entered into negotiations for that object; and after some correspondence with his father, which does equal credit to the filial duty of the son, and to the fond affection combined with careful prudence of the parent, these negotiations were closed by the acceptance of the sum of 900 guineas. It was not, however, without many risks that the possession of this treasure was obtained, and nothing but the straightforward promptness of the young aspirant could have availed to secure it. Besides other intended advances towards its acquisition, Dr. Sibthorp relates in a letter to his more successful competitor, that after the close of the actual contract, *he* had, in ignorance of that fact, offered the full sum of 1000 guineas; and we gather from various parts of the correspondence which took place upon this occasion, that even before the collections had arrived in this country, Dr. Smith had received numerous overtures for the purchase of the whole or portions of them, all of which he happily declined. But the most remarkable event by which its acquisition was jeopardized, was the attempt made by the king of Sweden

himself, Gustavus III., to prevent its expatriation. This monarch had been absent in France, and on his return, finding that this precious possession, as bright a jewel as any in his crown, was actually on board ship, and on its way from his shores, to become the property of a humble young foreigner, and to adorn the science of another country, he sent in all haste a vessel to the Sound, to intercept its voyage. Happily for us he was too late. The good ship had sailed, and the precious cargo was safely landed at our Custom-house in October 1784, ten months after the first offer was made.

The possession of these important documents—for the specimens themselves, as well as the literary portion of the collection, must be considered in this light—soon attracted the attention of men of science, both in this country and on the Continent, and drew from many of the most distinguished naturalists of the day letters of warm congratulation. Sir Joseph Banks, who had already evinced a sincere friendship for the young naturalist, encouraged him in a manner which must have been most gratifying to him. He became a Fellow of the Royal Society, with the entire concurrence of the President, in May of the following year.

It was now an object of great interest and importance to render the collection as available as possible for the advantage of science, by giving to naturalists free access to it for consultation and comparison. The young physician, after having made his well-known tour on the Continent, of which he has left a very pleasing published account, and during which he received the most flattering attention from all the eminent botanists of Europe, determined after his return, with the concurrence and earnest cooperation of many of his distinguished friends, to form a new Society for the cultivation of Natural History, and to render more available for general utility the treasures which he had lately obtained. In pursuance of this object, the Linnean Society was formed, under the auspices of his friend Sir Joseph Banks, the President of the Royal Society, Dr. Goodenough, afterwards Bishop of Carlisle, Mr. Marsham, and others. The first Meeting, which may be considered as initiatory, was held at the Marlborough Coffee-house, near Dr. Smith's own residence, on the 26th of February, 1788. After this period we cease to find his name recorded at any of the meetings of the Natural History Society, where he had often previously presided, and which did not long survive the institution of its more effective and influential rival. At this meeting the only persons present were the Founder, Dr. Goodenough, Mr. Dryander, Mr. Dickson, Mr. Beckwith, and Mr. Swainson; Dr. Smith was

then elected President, Dr. Goodenough Treasurer, and Mr. Marsham Secretary. After two or three other preparatory meetings, the first general meeting took place on the 8th of April in the same year, when the new Society was inaugurated by an interesting and learned discourse on the progress of Natural History by the President. This treatise forms the first paper in the Transactions of the Society, which however was not published until three years afterwards. In the first printed list of the Society, we find the names of almost all the English naturalists of any note at that period. Sir Joseph Banks was, with great propriety, elected an honorary member, and continued so until his death; and amongst the Fellows we find the names of Dryander and Goodenough, of Martyn of Cambridge, and Shaw and Lambert, and the Lathams, of Pulteney, and Relhan, and many others, who had then or have since distinguished themselves in the cultivation of Natural Science. In the list of Associates are the Indian Buchanan, Dr. Edward Whitaker Gray of the British Museum, Professor Hope of Glasgow, Markwick the annotator of White's 'Selborne,' and the elder Sowerby. And amongst the Foreign Members we have many of the most illustrious names which then adorned the Natural History science of Europe,—Afzelius, Allioni, Broussonet, Carolini, Desfontaines, Fontana, L'Héritier, Jussieu, the two Jacquins, Schumacher, Sparrmann, and Swartz, Targioni Tozzetti and Thunberg, with many others;—names, which show how rich was the foreign list of the Society, even at that infancy of its existence.

It is not my object to enter further into the life of our revered founder, than just to illustrate the progress of the Society, which owed its existence, its rise, and its prosperity, to the zeal, knowledge, accomplishments, and other estimable qualities which distinguished him. Few men were more entirely respected and beloved; and I believe the Society owes its comparative immunity from unkindly discussion, to the temper and judgment invariably displayed by him in its administration, which stamped upon it a character which seems almost to have become an essential element in its nature, and which I earnestly hope and believe it will never lose.

We have now then seen our Society fairly launched on her promising voyage with all the advantages of a skilful commander, of a willing and intelligent and hardworking crew, and under the happiest auspices, both with respect to her origin and object. It is not necessary that I should enter into any minute details of the Society's history. It gradually increased in fame, in usefulness, and in numbers. Not only were most of the *working naturalists*

of this country, one by one, enrolled in its list of members, but many men of rank and social influence sought the fellowship of the Society, and did themselves honour by the sanction which they thus afforded to its progress.

The increasing numbers and importance of the Society involved the necessity of its having a house and establishment of its own; and we find it located in Panton Square some time in or before the year 1802, in a house which it occupied conjointly with the Westminster Library. At this period its charter was obtained, and it took its permanent established rank amongst the then few chartered institutions of the country. The construction of the bye-laws followed, and the grant of arms from the Herald's College completed its individuality. From Panton Square it was removed to Gerard Street in the year 1805, where it continued until, by the death of Sir Joseph Banks in 1820, the house which that excellent person had long inhabited became vacant, and was in the following year taken by the Society, conjointly with your late distinguished President, Mr. Brown. I have thus hastily sketched the various changes of residence which the Linnean Society has made until the present time, and I will now recur for a few moments to some other circumstances which have marked its progress. Sir James Smith, after a residence in and near London of a few years, determined on returning to his native city of Norwich, where he spent the remainder of his life. This, however, did not prevent him from taking the same deep interest in the welfare of an institution which he had founded, and which he had seen so prosperous under his auspices and guardianship. He was accustomed to spend two or three months in every year in London, principally for the purpose of keeping up his connexion with it, and the Fellows continued annually to renew his election as President, until his lamented death in the year 1828, after he had held that office from its foundation forty years before. The late Earl of Derby, then Lord Stanley, succeeded him in the Chair, and he was followed by the late Duke of Somerset; on his retirement, the amiable Bishop Stanley was elected President, and retained the Chair until his death, when your happy choice fell on the most distinguished botanist of his day, whose high scientific attainments, extensive general knowledge, and combined wisdom and kindness of heart, at once secured to him the deep respect and affection of all who have ever known him, and reflected honour upon the Society which had chosen him for their President.

After the decease of Sir James Smith, the whole of the Linnean

Collection (with the exception of the minerals), which he had more than forty years before obtained under the circumstances which I have hastily detailed, together with his own valuable additions to it both in books and specimens, were purchased by this Society, and now constitutes its richest possession. At the last Anniversary I had the pleasure of reading to you a report of the Committee appointed by your Council to consider and report upon the state of these Collections, and announced the gratifying fact that they were upon the whole in excellent condition. The recommendation of that Committee will now be fully carried out, by the separation and arrangement of the actual Linnean books and specimens, in such a manner as to render them most readily available for consultation.

And now, Gentlemen, it behoves me to pause for a moment, and ask, what has the Society done during the seventy years of its existence? What are the records of its progress, and what the results of its labours? For a reply to this question, I will refer you to the history of Natural Science throughout the world for those seventy years. I will point to the twenty-two volumes of our Transactions, which are to be found, worn by the hands of the students of Natural History, on the shelves of every important scientific library in Europe, I may say in the civilized world. I will refer you to the list of our Members, home and foreign, and to the respect in which the Society is held by scientific naturalists in every quarter of the globe. Gentlemen, this is not a vain-glorious boast. It is the simple assertion of a truth, which may be enunciated from this chair with honest satisfaction, in the full consciousness that it will be responded to by every one that hears me. What, then, must be the responsibilities of the successors of those who have in past times set so illustrious an example? I have no fear that the character of the Society or its usefulness will suffer, whilst I find the places of those who are gone filled up by a younger race of naturalists, their equals in intelligence, in zeal, and in honesty and truthfulness of purpose.

Having thus taken a very hurried review of the Society's rise and growth, which I fear must have inflicted on many of you the tedium of an oft-told tale, I will, with as much brevity as possible, record the circumstances, most interesting to you, which have occurred since our last Anniversary Meeting. I took leave of you then with the announcement, that only on the previous evening had it been satisfactorily determined that the Linnean Society was to have the privilege of occupying rooms in Burlington House,



and thus be recognized by the Government as deserving of being located in a government building. Shortly after that time a meeting of the Royal Society was held, at which the President of that body stated to the Fellows what steps had been taken with reference to the location of the Societies in this building, and he then publicly asked the President of the Chemical Society, Professor Miller, and myself as your representative, whether the two Societies would be satisfied with the accommodation then offered them. That accommodation appeared to us to be very liberal, and such as would amply satisfy our needs, and we both expressed our cordial assent to the arrangement. I will now detail to you in what it consists. The entrance-hall is common property; on the ground floor we have two front rooms on the east side of the Hall, the first of which contains our principal botanical collections, and the second, which will also be our Council-room, has the New Holland birds and other animals which were arranged round the walls of the Council-room in Soho Square. This room will also be used for the meetings of the Council of the Chemical Society, to whom it had been originally assigned, but who gave it up to us with this understanding. On the principal floor we have the room in which we are now assembled, as our ordinary meeting-room, and the great Ball-room, now appropriated to our library. The whole of the second floor is also allotted to us, consisting of eight commodious rooms. Of these three are devoted to our Librarian, and three to the Porter. One large room will contain such parts of the Collection as are least frequently used, and the other a certain portion of the stock of the Transactions. There are also very extensive dry lofts, which form excellent store-rooms. The north end of the library is set apart for the Linnean Collections,—the Herbarium being arranged on one side, the zoological specimens on the other, and the books partly on each side. The great Hall, forming the west building, is also at the service of the Society if it should ever be required. The Committee, to whom the Council entrusted the whole arrangements of the removal, have been most anxious and careful to accommodate the Fellows, and to facilitate their use of the library and collections, and I believe I may with confidence anticipate that their labours will prove perfectly satisfactory. It will readily be believed that the removal of so large an establishment, and our location in a new and very differently arranged abode, would be attended with great expense. It became necessary to appeal to the Fellows for their assistance and cooperation. That appeal has been met in a spirit of ready liberality; and a

purely voluntary subscription, to the amount of very nearly £1100, attests the sincere interest which the Fellows at large take in the well-being of the Society, and their appreciation of our present change. I have to add to this notice of our new arrangements, that as the whole of the libraries of the three Societies located here are now accessible to the members of each, the Royal Society have spontaneously caused their fine collection of books in natural history to be placed, for the greater convenience of naturalists, in that part of their library which is contiguous to our own.

You have been called upon during this Session to confirm an alteration in the bye-laws, the effect of which will be to enable this Society to hold its ordinary meetings on the same night as the Royal Society. The Chemical Society has adopted a similar arrangement. When this plan was first proposed, I felt very strongly the obvious objection, that when any paper interesting to the naturalist should be read at the Royal Society on the evening of our meeting, it would be impossible for any one of our body to be present without deserting his own party, and possibly losing some interesting communication here. On my pressing this difficulty on Lord Wrottesley, with whom, as President, the arrangement of the reading of the papers at the Royal Society rests, he assured me in the kindest manner, that, as far as practicable, the reading of such papers should take place on those evenings on which the Linnean Society do not meet. The new arrangement, which will not take place until the next Session, will enable the Fellows of the three societies and their visitors to assemble, after the business is over, at tea; and thus a pleasant *conversazione* may be anticipated on every evening of these simultaneous meetings.

A second year has now elapsed since I announced the resolution of the Council to issue the "Journal of our Proceedings." To a great extent this plan appears to have succeeded well; and although the sale of the separate parts out of the Society has not been considerable, yet the value of its contents, the regularity of its appearance, and the fact of its being sent to the Fellows without any trouble or expense on their part, has caused universal satisfaction. It is particularly gratifying to find, that notwithstanding the considerable expense of the publication, our increased prosperity has enabled us to meet it; and I doubt not that this prosperity is in a measure due to the obvious value and attraction of the publication itself. There is one drawback, however, on the advantages of the Journal, to which I allude with great regret, as it indicates in its cause a still more important defect;—I refer

to the disparity which exists between the zoological and botanical portions of it. A great possible difficulty, which I could not but foresee in the separate paging and sale of the two parts, has thus become realized; and it appears to me not impossible that it may hereafter be necessary to consider carefully whether it may be desirable to continue the present separable form. The deficiency to which I have alluded in the number and importance of the zoological papers communicated to the Society, leads me to make a few remarks on the probable causes which may have led to it; and I think it is not difficult to trace it to the numerous minor societies which cultivate, in one form or other, this department of natural history, and thus draw away from the parent Society numerous papers of various degrees of merit, which would otherwise have found their place at our meetings, and many of which might have worthily occupied the pages of our two publications. I am well-aware of the great importance of a healthful division of labour. I do not in any respect depreciate the value of the labours of other societies; but I do believe that science would be promoted by a greater concentration of the talent and research which are now diverted into so many channels, increasing thus the difficulties of the student, by unnecessarily multiplying the sources from which he must draw his information. In the case of the Zoological Society we have an example, in which the very steps which were taken to effect a particular object, have become the means of frustrating it, and have increased the defect which it was intended to obviate. The Zoological Club of the Linnean Society was instituted in the year 1822, and was composed exclusively of Fellows of the Linnean Society. Its objects were to encourage the presentation of papers on zoological subjects, and to promulgate those systematic views which at that time were prevailing, under the influence of MacLeay and Vigors and Swainson and others. The primary and ostensible object, however, was the encouragement of the zoological element in the Linnean Society. After having existed and done good work for about seven years, a Special Meeting was called to dissolve the Club, and it became transferred to the Zoological Society, and formed its scientific department, from which has emanated so great a mass of zoological information of the highest character. I do not wish now to dwell upon this fact, but I am fully justified in saying that the diversion of so much important matter from this Society has undoubtedly been one principal cause of the obvious declension of our zoological element. The recent resolution of the Council of the Zoological

Society to discontinue, from the present time, the publication of their quarto Transactions, will in all probability restore to us a portion of our lost prestige: and I cannot quit this subject without pointing with particular pleasure to the paper by Professor Owen, lately read at our Meetings, which I unhesitatingly pronounce to be one of the most complete and profoundly philosophical examples of zoological generalization it has for a long time been my lot to listen to. The importance and interest attaching to this essay made me anxious to present you with an abstract of its reasoning, but my time will only allow me to give a very hasty sketch of the principal positions taken by the author.

With respect to the first part of the paper on the characters of the Mammalia, its value chiefly consists in the additions to those usually given in zoological works, and they evince the same laborious and long-continued research as characterizes all Professor Owen's productions. His own views are based upon the constancy of certain modifications of the brain in certain proportions in the class Mammalia, and on the importance of those cerebral characters. The first of these, discovered by the author many years since in the brain of the kangaroo, and since ascertained by him to be common to the *Marsupialia* and *Monotremata*, is the absence of the supra-ventricular part of the corpus callosum, and the reduction of the commissural part of the hemispheres to the anterior commissure and fornix. With this is associated the non-development of the placenta, the premature birth of the offspring, the presence of marsupial bones and other characters. To this primary division or subclass, the lowest in its organization, the author gives the name *Lyencephala*. The second stage in the cerebral development consists in the presence of the corpus callosum, but connecting hemispheres as little advanced in bulk and external character as in the former. The animals thus characterized are termed *Lissancephala*, which include the orders Rodentia, Insectivora, Cheiroptera, and Bruta. In the third subclass, the *Gyrencephala*, the cerebrum extends over more or less of the cerebellum and olfactory lobes, and the superficies is ordinarily convoluted; and in this subclass are placed the orders Cetacea, Sirenia, Toxodontia, Proboscidea, Perissodactyla, Artiodactyla, Carnivora, and Quadrumana. But the most important application of the cerebral characters is that by which man is raised, by the present classification, above the rest of the mammalia, not merely as a distinct order, but as the type of a subclass. "Not only," says the author, "do the cerebral hemispheres overlap the olfactory lobes and cerebellum, but they

extend in advance of the one and farther back than the other; this development produces a third lobe, which with some other additional parts is peculiar to the genus *Homo*, and is common to the lowest as to the highest varieties of the species." The name which Professor Owen proposes for this highest form is *Archen-cephala*. The author next enters into the subdivision of the four primary divisions of the class. In this portion of the paper, the necessary association of the order Bruta with the Cheiroptera, Insectivora, and Rodentia in the same subclass Lissencephala, and the removal of the Quadrumana to the Gyrencephala, from their supposed association with the former subclass, are supported with great acumen; and some of the characters from which the first-named assumed affinities are taken, shown to be fallacious.

These and many other important views of classification, and the enunciation of doctrines of affinity, which are no less profound than they are novel, will undoubtedly attract the attention they deserve. Into the detail of these I regret that my time will not allow me now to follow Prof. Owen; nor into the very interesting and extended views which he promulgates on the successive development of the various mammalian types in the earlier periods of creation. The whole of this valuable communication will well repay the most careful and serious study; and I the less regret that it is not now in my power to make its principles known in greater detail, as the paper itself will be immediately before the world in the next part of the Proceedings.

In connexion with the subject of our Zoological Proceedings, I have the great satisfaction to state, that a distinguished zoologist and physiologist has kindly allowed himself to be put in nomination under the designation of Under Secretary. Professor Busk's election to that nominal office will be of great value to the Society, by affording us the constant services of a Zoological Secretary; whilst it will be the means of relieving our invaluable friend Mr. Bennett of a portion of that incessant labour which he has now for so many years so kindly, so cheerfully, and with so much zeal and intelligence and wisdom, performed for us.

The past year has been distinguished by remarkable prosperity. Our ranks have been augmented by the accession of an almost unprecedented number of new Members, some of them ardent young naturalists, to whom we may look with confidence to fill worthily the places of those who are year by year passing away, and others whose labours have for many years advanced the science, the literature, and the social improvement of our country in various departments of knowledge.

It has been most gratifying to me personally, and I am confident you have all participated in the feeling, to hail the return amongst us of one who was formerly associated with us, but whose important and extensive labours in physics have called his attention away, for many years, from those studies which are more particularly ours. The close connexion of General Sabine with the Royal Society, of which he occupies an office next to the highest, and the great and deserved influence he possesses in its councils, have been of especial value in bringing about that closer connexion which now exists between us.

I cannot refer to the appearance of the last part of our Transactions without the utterance of a grateful recognition of an unprecedented act of liberality on the part of one of our most zealous and distinguished Fellows. The exquisite illustrations of Dr. Hooker's elaborate paper on the *Balanophoræ*, the expense of which amounts, as you will see by the financial statement, to nearly £90, are presented to the Society by the joint liberality of the author and his friend and coadjutor in so many meritorious works, Dr. Thomson of Calcutta. The close alliance and friendship of two such kindred minds, shown in their joint endurance of the perils and hardship of travel, no less than in their combined services in the cause of their favourite science, forms a most interesting example of the influence of the study of nature in awakening and perpetuating the kindest and most harmonizing principles of the human mind. Of the paper itself, I cannot of course offer any opinion of my own. I understand that it is one of the greatest interest, and I know it is the result of long and profound research. Amongst the points upon which Dr. Hooker particularly dwells, and which, if confirmed, are of the most importance, are the explanation of the anomalous vascular system, and the reduction of this to the exogenous type,—the history of the mode of parasitism in these remarkable plants—the discovery of an embryo in several species—the view taken of the ovule as reduced to an embryonal sac—the proof of the close resemblance between the *Balanophoræ* and *Gunnera*, and tracing the variations of the species and their immense geographical distribution in both longitude and latitude. Some of these points are, I understand, the subject of controversy, and the proof is considered a matter of much importance both to the physiological and systematic botanist.

On a comparison of our present condition with that of the last anniversary, I may on almost all points offer the Society unmingled congratulations. The accession of no less than thirty-one Fellows, the favourable aspect of our financial account, in which

we find a balance in our favour increased by a considerable sum, in addition to a decrease of our bonded debt to the amount of £200, our association with our great progenitor the Royal Society, and with another scientific body, with greatly increased accommodation, and the prospect of immunity from rent,—these are all subjects for thankful reflection. But the retrospect of any past year is necessarily of a mixed character; it has its dark as well as its bright aspect;—and in so large a body as ours, we cannot hope to meet, on the return of our anniversary, without having to look back on the loss of many whom we can ill spare from amongst us. Of the fifteen of our Fellows who have been removed from us by death since our last annual record, there is one, honoured and beloved, whom I cannot, in justice to my own feelings and yours, pass over without a humble but sincere and loving tribute of affectionate regret. Mr. Bennett will doubtless give you, in his own effective and feeling language, a brief account of the life of our deeply-lamented friend Mr. Yarrell. It is sufficient for me to speak of him as my own warm-hearted and constant friend of more than thirty years,—as the earnest and zealous Fellow and Treasurer of this Society,—as the truthful and acute and accurate student and historian of nature, and as one of the most kindly, sincere, single-minded and simple-hearted men that ever lived.

### OBITUARY NOTICES.

The Secretary read the following notices of deceased *Fellows* :—

*Thomas Worthington Barlow, Esq.*, was a native of Cheshire, and became a student of Gray's Inn. He was admitted to the bar, and was for some time settled in Manchester, but a year or two since he proceeded to Sierra Leone in the capacity of Queen's Advocate, and died at Freetown, in that colony, on the 10th of August last, at the early age of 33. Natural History, together with the literary history of his native county, early attracted his attention; and he published in 1847, in a large tabular form, "A Chart of British Ornithology, adapted to popular use, and dedicated to his Fellow-Members of the Wernerian Club." In the following year he became a Fellow of the Linnean Society, and in 1852, he printed, under the title of "The Mystic Number, a glance at the System of Nature," the substance of a lecture which he had delivered some years previously, and in which

he adopted and maintained the circular and numerical system of MacLeay, as modified by Swainson. He also commenced the publication of a work entitled "Cheshire; its Historical and Literary Associations, illustrated in a series of Biographical Sketches," 8vo, Manchester, 1852; but these sketches were not continued beyond a few remarkable names, occurring under the letter B.

*The Rev. John Bransby, M.A.*, was educated at St. John's College, Cambridge, where he took his Bachelor's degree in 1805, and that of Master of Arts in 1808. For many years he was curate of the parish of Stoke Newington, and in 1845 he became rector of Testerton, in the county of Norfolk. In 1814 he was elected a Fellow of the Linnean Society; and he was also a Fellow of the Society of Antiquaries, of the Geological Society, and of the Cambridge Philosophical Society. He died at King's Lynn, after a short illness, on the 5th of March of the present year, at the age of 74.

*Walter Buchanan, Esq.*, well known to most of our older Members by his former frequent attendance at our Meetings, was originally engaged in mercantile pursuits, but had for some years past retired from business. He was latterly an active magistrate of the county of Middlesex, and took a prominent part in the management of the County Lunatic Asylum at Hanwell. He became a Fellow of the Linnean Society in 1817, and was likewise a Fellow of the Horticultural Society. His death occurred at his residence in Sussex Terrace, Hyde Park, on the 9th of November last, in the 70th year of his age.

*The Very Rev. William Buckland, D.D., F.R.S., F.G.S., &c.*, Dean of Westminster, was born at Axminster, in the county of Devon, in the year 1784. He was educated first at Tiverton School, and was afterwards, in 1798, removed to St. Mary's College, Winchester; thence he passed, in 1801, to a scholarship in Corpus Christi College, Oxford, of which in 1808 he became a Fellow. His degree of B.A. was taken in 1803. His taste for the study of geology was manifested at a very early age: while yet a child his attention had been directed to the "Cornua Ammonis," found in the rocks around his home; at Winchester he collected the fossils of the chalk; and during his early residence at Oxford, those of the oolite. From 1808 to 1812 he made frequent excursions on horseback to various parts of England, Scotland, Ireland, and Wales, collecting sections of the strata and specimens of their organic contents. In 1813, on the resignation of Dr. Kidd, he was appointed Reader of Mineralogy in the University of Oxford, to which, in 1818, was added the Readership of



Geology, then first established by the Government in accordance with his strenuous recommendations. His lectures on both these subjects, but especially on geology, attracted in a high degree the attention and admiration of the University, and speedily obtained for him a position among the most eminent and active of the inquirers into the physical history of the earth. His Introductory Lecture, as Reader of Geology, was published in 1820, under the title of "*Vindiciæ Geologiæ, or the Connexion of Geology with Religion Explained*"; and his first important paper "*On the Coasts of the North of Ireland,*" written in conjunction with the Rev. W. D. Conybeare, was published in the third volume of the *Transactions of the Geological Society.* His reputation as a geologist was, however, still more completely established by his "*Account of an Assemblage of Fossil Teeth and Bones of the Elephant, Rhinoceros, Hippopotamus, Bear, Tiger, Hyæna, &c., discovered in a cave at Kirkdale, Yorkshire,*" which was printed in the '*Philosophical Transactions*' for 1822, and was in the same year rewarded with the Copley Medal. This celebrated paper, enlarged and published separately in 1823, under the title of "*Reliquiæ Diluvianæ,*" forms an important epoch in the history of geological science. It is needless to particularize the titles of his numerous memoirs which succeeded each other in rapid succession in the '*Transactions*' and '*Proceedings*' of the Geological Society, in the '*Annals of Philosophy*,' the '*Philosophical Magazine*,' the '*Edinburgh Philosophical Journal*,' the '*Reports of the British Association*,' &c. The list of his publications in the '*Bibliographia Zoologiæ et Geologiæ*' of the Ray Society amounts to sixty-seven. It would be improper, however, to omit noticing here his sole contribution to our own '*Transactions*,' a paper "*On the Adaptation of the Structure of the Sloths to their peculiar mode of life,*" printed in our seventeenth volume; and his Bridgewater Treatise, entitled "*Geology and Mineralogy considered, in reference to Natural Theology,*" 2 vols. 8vo. 1836, a work distinguished at once for the multitude of facts brought to bear upon its subject, and for the attractive manner in which they are placed before the reader. Dr. Buckland became a Fellow of the Geological Society in 1813, of the Royal Society in 1818, of the Linnean Society in 1821, and received diplomas from a great number of scientific societies both at home and abroad, among which was that of a Correspondent of the Academy of Sciences of the Institute of France. He was elected President of the Geological Society in 1824, and again in 1840; and was also President of the British

Association, at their second meeting at Oxford in 1832. In 1825 he received a valuable acknowledgment of his established merit in the gift of a Canonry of Christchurch, and in 1845 was nominated by Sir Robert Peel to the Deanery of Westminster. He was elected a Trustee of the British Museum in 1847, and took an active part in the establishment of the Museum of Practical Geology, under the direction of his old and valued friend Sir H. T. De la Beche. From Sir Henry's hands, as President of the Geological Society, he received, in 1848, the Wollaston Medal; and soon after closed his long series of geological honours. In the year 1850 his mind ceased to occupy itself with those studies which had previously formed his favourite pursuit; and he died on the 15th of August last, at the age of 72. Few men have contributed so largely to the progress of geology as Dr. Buckland. Careless of originating new views in relation to its theoretical aspects, his whole life was devoted to the collection of a rich store of materials for its advancement as a science of facts. A large portion of his time was spent in travelling over the British Islands and on the continent of Europe, forming everywhere important collections, which he subsequently placed in the Oxford Museum, now, through his exertions, so deservedly celebrated as among the first of geological collections. His unwearied spirit of research, the fertility of his genius in the formation of new and unexpected combinations, the peculiar felicity of his illustrations, and the genial character of his eloquence, all combined to render his writings, his lectures, and the part which he took in discussions at the Geological Society and elsewhere, both weighty and attractive; while the warmth of his heart and the steadiness of his friendship peculiarly endeared him to his more intimate connexions. Among the many great names in geology which have departed from among us within the last few years, none has acquired a more widely-extended fame or been attended by more grateful recollections.

*Sir William Ogle Carr, Knt.*, Chief-Justice of the Supreme Court at Ceylon, was the third son of William Francis Carr, Esq., of Frognal, Hampstead. He became a student of Gray's Inn in 1820, and was called to the bar in 1826. After practising for some time in England, he went to Ceylon, where he was admitted Queen's Advocate, and in 1839 was appointed second puisne Judge. In 1854 he became Chief-Justice, and was at the same time created a knight. Sir William O. Carr was married to Miss Clement, daughter of Col. John A. Clement, R.A.; and was just on the point of returning to England to enjoy the repose which

his long services in India had merited, when he was carried off almost suddenly, and died at his residence, Uplands, in the neighbourhood of Colombo, on the 24th day of April, 1856, at the age of 53. He became a Fellow of the Linnean Society in 1830.

*Sir Alexander Crichton, M.D., F.R.S.*, a medical practitioner of considerable eminence, and one of the oldest Fellows of the Linnean Society, was the second son of Mr. Alexander Crichton, of Woodhouselee and Newington, in the county of Mid-Lothian, and was born at Edinburgh on the 2nd of December, 1763. After completing his school education in his native town, he was apprenticed to Mr. Wood, an eminent surgeon in that city. At the expiration of his apprenticeship, having first matriculated in the university, he proceeded, in 1784, to London, and in the following year to Leyden, where he obtained his degree of M.D. From Leyden he went to Paris, which he quitted in the summer of 1786, and extended his tour of instruction into Germany, visiting successively, during a period of three years, the schools of Stuttgart, Vienna, Halle, Berlin, and Göttingen. In 1789 he established himself as a surgeon in London, and became a Member of the Royal College of Surgeons; but disliking the operative part of the profession, he withdrew from that body in 1791 and became a Licentiate of the College of Physicians. In the following year he published a translation of Blumenbach's "Essay on Generation"; and being appointed, about 1796, one of the Physicians of the Westminster Hospital, he delivered in that institution the lectures on chemistry, materia medica, and the practice of physic. In 1798 he published "An Inquiry into the Nature and Origin of Mental Derangement," in 2 vols. 8vo, which added to the high reputation he had acquired both at home and abroad as a skilful practitioner, and assisted in introducing him into high professional practice. In 1803 he was invited to become Physician in Ordinary to the Emperor of Russia; and a few years afterwards was appointed Chief of the Civil Medical Department. For his various important services he received several Russian Orders, as well as the second class of the Prussian Order of the Red Eagle, which, on his receiving the honour of knighthood from King George IV. in 1821, he obtained permission to wear. Besides the works above mentioned, Sir Alexander Crichton was author of two separate publications on the Cure of Pulmonary Consumption, and of a work entitled "Commentaries on some Doctrines of a dangerous tendency in Medicine, and on the General Principles of Safe Practice," 1842. While in Russia, he edited, in conjunction with

Rehmann and Burdach, a periodical work entitled "Russische Sammlungen für Naturwissenschaften und Heilkunst," of which two volumes appeared, at Riga and Leipsig, 1815-1818: and after his return to England, he published, in the Annals of Philosophy, a paper "On the Climate of the Antediluvian World, and its Independence of Solar Influence; and on the Formation of Granite"; and communicated to the Geological Society, memoirs "On some Fossil Shells from Langton Green near Tunbridge-Wells"; "On some Vegetable Remains found in the Sandstone which underlies the lowest bed of the Carboniferous Limestone near Ballisadiere, in the county of Sligo, Ireland"; and "On some parts of the Taunus and other Mountains in the Duchy of Nassau," which are published in the Transactions and Proceedings of that Society. He printed also at St. Petersburg, in 1807, an "Extract of a Letter on a Mammoth preserved in Ice, from Dr. Crichton to Dr. Babington." Sir Alexander Crichton was elected into the Linnean Society in the year 1793, and had consequently been a Fellow for nearly sixty-three years at the time of his death, which took place in June last, in the 93rd year of his age. In the year 1800 he became a Fellow of the Royal Society, and he was also a Fellow of the Geological Society, a Member of the Imperial Academy of Sciences at St. Petersburg, and of the Natural History Society of Moscow, a Corresponding Member of the Royal Society of Sciences at Göttingen, of the Academy of Medicine at Paris, and of many other societies. In the year 1800, he married Frances, daughter of Mr. Edward Dodwell, of East Moulsey, who survived him only for about six months, and by whom he has left one son and several daughters.

*The Right Hon. William Henry Dawnay*, seventh *Viscount Downe* in the Peerage of Ireland, and a Baronet of England, was born on the 15th of May, 1812, and educated at Christchurch, Oxford, where he graduated as B.A. in 1833, and as M.A. in 1837. He was elected in 1841 one of the representatives of the county of Rutland, and continued to occupy his seat in the House of Commons until 1846, when, on the death of his father, he succeeded to the family honours. From this time he occupied himself chiefly in superintending and contributing to a variety of benevolent objects; such as founding new churches, rebuilding those which had fallen into decay, adding to the endowments of poor livings, building parsonages, erecting schools, and improving the comforts of the labourers on his extensive estates by rendering their cottages healthful and commodious. His lordship became a

Fellow of the Linnean Society in 1841, and died at Torquay, to which place he had some time since retired, on account of his declining health, on the 26th of January in the present year, and in the 45th year of his age.

*Francis King Eagle, Esq.*, was the second son of Robert Eagle, Esq., of Lakenheath, in the county of Suffolk. He was educated at Trinity College, Cambridge, where, in 1809, he graduated as LL.B., and in the same year he was called to the bar. For many years he attended the Norwich circuit, and obtained a high reputation as a tithe-lawyer, which branch of the profession he had made the subject of a profound research, having published in 1826 (in conjunction with Mr. Yonge) a highly valuable "Collection of the Reports of Cases, the Statutes, and Ecclesiastical Laws relating to Tithes," in 4 vols. 8vo. He subsequently became a bencher of the Middle Temple, a Justice of the Peace for the counties of Norfolk and Suffolk, and Judge of the County-Courts of Suffolk. Rather late in life he married the eldest daughter of the late Sir James Blake, Bart., of Langham Hall, who survives him, and by whom he has left one son. Mr. Eagle became a Fellow of the Linnean Society in 1807, and was much attached to the study of British Botany, being well-acquainted with the Cryptogamous plants, and especially with the Mosses. He died at Bury St. Edmunds, on the 8th of June, 1856, at the age of 68.

*William Gourlie, Esq.*, the son of a highly-respected Glasgow merchant, was born in that city in March 1815, and received an excellent education at the public schools, and afterwards at the university of his native city. On his father's removal to the neighbourhood of the town, he acquired a taste for gardening, which soon expanded into a love of botany, and led to his attendance, first on the lectures of Sir William Hooker, and afterwards on those of Professor Balfour. From his earliest years he was remarkably regular and orderly in his habits, and was thus enabled to give much time to mental improvement, even while engaged for many hours a day in mercantile pursuits. His botanical collections were at first limited to British plants, among which he paid particular attention to the Mosses; but latterly he acquired large foreign collections, which he is stated to have left in excellent condition. His collection of shells was also extensive and well-arranged, and his cabinet contained many interesting specimens of fossil plants. From the time of his entering into business in conjunction with his father, his connexion with the colonies enabled

him to procure many specimens of new and rare objects, which he freely imparted to naturalists and natural-history institutions both at home and abroad. In 1836 he joined the Edinburgh Botanical Society, and acted as its Local Secretary for Glasgow; and in 1841 he entered the Philosophical Society of Glasgow, and took an active part in promoting its welfare. He was also an active promoter of various benevolent institutions, and set a noble example to commercial men, by proving to them that literary and scientific pursuits may be made perfectly compatible with the utmost regularity in carrying on the concerns of an extensive business. In the year 1855 he became a Fellow of the Linnean Society; and in the same year, when the Meeting of the British Association last took place in Glasgow, was appointed one of the Local Secretaries. His successful exertions to render the meeting creditable to Glasgow, to add to the comfort of those who visited it, and to make all the objects of scientific interest easily accessible to them, called forth the warmest commendations; but they appear, by overtaking his energies, to have assisted in calling into action a cancerous or fungous disease of the face, which speedily assumed a malignant character, and to which, after some months of severe suffering, he fell a premature victim. He died at the house of his brother at Pollockshields, on the 24th of June last, in the 42nd year of his age, leaving a young widow and two children of tender age. His loss has been deeply felt in his native city, where his excellent business habits, combined with an ardent love of science, and a strong desire to render himself useful in all benevolent, literary, and scientific objects, had placed him among the foremost men, and seemed to have prepared for him a career of higher eminence and more extended usefulness.

*Rear-Admiral Philip Parker King, R.N., F.R.S., and Member of the Legislative Council of the Colony of New South Wales*, was the son of Philip Gidley King, Capt. R.N., who was first Governor of Norfolk Island, and afterwards of New South Wales, and who, in the latter capacity, is recorded by Mr. Brown, as having "materially forwarded the objects of Captain Flinders' voyage," and as one "to whose friendship Mr. Ferdinand Bauer and himself were indebted for important assistance in their pursuits while they remained in that colony." Philip Parker King was born at Norfolk Island on the 13th of December 1793, and entered the Navy in 1807 as a first-class volunteer, on board the *Diana* frigate, Capt. Charles Grant. After eighteen months' service he obtained the rank of midshipman, and served on board various ships until the

conclusion of the war, being several times noticed for his gallantry in action. In 1814 he was promoted to the rank of lieutenant, and in 1817 was entrusted with the conduct of an important expedition intended to complete Capt. Flinders' survey of the coast of New Holland; a service in which he continued to be employed, first in the Mermaid cutter, and afterwards in the Bathurst sloop (to the command of which he was promoted by commission dated July 17th, 1821), until the year 1823. The results of his four voyages in these vessels are contained in "A Narrative of the Survey of the Intertropical and Western Coasts of Australia, performed between the years 1818 and 1822," 2 vols. 8vo, Lond. 1827, and in an Atlas, published by the Hydrographical Office of the Admiralty. In these voyages he was accompanied by an able and indefatigable botanist, Mr. Allan Cunningham, to whom "on all occasions he gave every assistance in his power," and whose grateful sense of Captain King's unvarying friendship terminated only with his life. Besides the botanical collections, of which Mr. Cunningham gave some account in the Appendix to the 'Narrative,' valuable Collections were also made in other branches of natural history, and the appendix contains contributions by Dr. Gray, on the Mammalia, Reptiles, and Shells; by Mr. W. S. MacLeay, on the Annulosa; by Capt. King himself, aided by Mr. Vigers, in relation to the Birds; and is more especially distinguished by a most important memoir by Mr. Brown, entitled "Character and Description of *Kingia*, a New Genus of Plants found on the South-west coast of New Holland: with Observations on the Structure of the Unimpregnated Ovulum; and on the Female Flowers of Cycadeæ and Coniferæ." The high qualifications of Capt. King as a surveying officer had now so completely established him in the confidence of the Admiralty, that he was not long permitted to remain unemployed. In September 1825 he was appointed to the command of the Adventure sloop, with orders to survey the southern coast of America, from the entrance of the Rio Plata round Cape Horn as far as the archipelago of Chilœ, and the coasts of Terra del Fuego. In February 1830 he received his commission as Post-Captain, and in November of the same year he returned to England, leaving his second in command, Capt. Fitzroy, to complete the remainder of the survey, and to give to the world the detailed account of the proceedings of the two vessels. He himself published in 1832, a volume entitled "Sailing Directions for South America," and a second part was afterwards added by Capt. Fitzroy. The "Narrative of the Surveying Voyages of His Majesty's Ships

Adventure and Beagle, between the years 1826 and 1836," vol. i., containing "Proceedings of the First Expedition, 1826-1830, under the command of Captain P. Parker King, R.N., F.R.S.," was published in 1839. In this expedition, as in his former one, Captain King secured the assistance of an excellent botanical collector, Mr. Anderson, and also superintended the formation of a zoological collection of considerable extent, of the mammalia, birds, and shells, composing which he gave, in an appendix to the 'Narrative,' a catalogue, with descriptions of new species, being assisted in the conchological part by the valuable advice of Mr. Broderip. The insects have been described in three papers in the 17th, 18th, and 19th volumes of our Transactions, entitled "Descriptions, &c. of the Insects collected by Captain P. P. King, F.R.S., in the Survey of the Straits of Magellan," by Mr. Curtis, Mr. Halliday, and Mr. Walker. On his retirement from active service, Captain King returned to New Holland and succeeded Sir Edward Parry in the management of the affairs of the Australian Agricultural Society, the duties of which office he discharged for several years with exemplary ability and fidelity. He once again visited England on the affairs of the society; but soon returning to Australia, he became first a nominated, and afterwards a representative Member of the Legislative Council, and took an active part in the business of the House. In the autumn of 1855 he was promoted to the rank of Rear-admiral of the Blue, but the intelligence only reached him a few weeks before his death, which took place in February 1856, at his residence, Grantham, North Shore, Sydney, in the 63rd year of his age. Both in public and private life, Admiral King merited and obtained the cordial regard and high respect of all who knew him; and the strong interest which he invariably took in all that related to natural history, and the encouragement which he gave in his different voyages to the formation of collections of plants and animals, are well calculated to endear his memory to the members of a natural-history society. He was elected into both the Royal and Linnean Societies in the year 1824, and was also a Member of the Royal Asiatic Society, and a Corresponding Member of the Zoological Society. He married Harriet, the daughter of Christopher Lethbridge, Esq., of Launceston, in the county of Cornwall, who, with a numerous family, survives him. Besides the zoological notices already referred to, Admiral King was the author of papers "On the Animals of the Straits of Magellan," Zool. Journ. iii. 422, iv. 91; "On the Geology of the Straits of Magellan," Proc. Geol. Soc. i. 29; "On the Cirrhipeda, Conchi-



fera, and Mollusca collected by the Officers of H.M.S. Adventure and Beagle in the years 1826-1830," Zool. Journ. v. 332; "Characters of New Genera and Species of Birds from the Straits of Magellan," Proc. Comm. Zool. Soc. i. 14, 29; and "Observations on Oceanic Birds, particularly those of the Genus *Diomedea*, &c.," Proc. Zool. Soc. ii. 128.

*John Moore, Esq.*, President of the Literary and Philosophical Society, of the Natural History Society, and of the Botanical and Horticultural Society of Manchester. Of this gentleman, who became a Fellow of the Linnean Society in 1826, I hope hereafter to be able to procure some particulars; but the very recent date of his death has precluded my obtaining them in sufficient time for reading on the present occasion.

*William Haseldine Pepys, Esq.*, was well known as an eminent cutler and maker of philosophical apparatus. His studies were chiefly directed towards chemistry; and in early life he made many experiments in common with the late W. Allen, the results of which were for the most part communicated to the Royal Society, and appeared in the 'Philosophical Transactions.' One of these papers "On the Respiration of Birds," published in vol. 119, may be more particularly mentioned here for its bearing on animal physiology; as may also another memoir by Mr. Pepys alone, "On the Decomposition of Sulphate of Iron by Animal Matter," which appeared in the first volume of the 'Transactions of the Geological Society.' He became a Fellow of the Royal Society in 1808, and of the Linnean in 1821, and was also a Fellow of the Horticultural Society. His death took place at his residence in Earl's Terrace, Kensington, on the 17th of August last, at the age of 81.

It will be in the recollection of many of my hearers, that at our last Anniversary much anxiety was expressed respecting one of our distinguished Members, *Daniel Sharpe, Esq.*, who, four days before, had been thrown from his horse in the neighbourhood of Norwood, and was then labouring under the effects of a concussion of the brain. For a few days he was believed to be going on favourably; but a sudden relapse soon put a period to the hopes which were then entertained, and he died on the 31st of May last, as was afterwards ascertained, from an extensive fracture of the base of the skull. He was born in London in 1806; and was the youngest of a numerous family, his mother, the sister of the poet Rogers, dying a few weeks after his birth. His school education was acquired at Walthamstow; and belonging to a commercial

family, he was early initiated into mercantile pursuits, which continued to engage his attention throughout the remainder of his life, but left him sufficient leisure to prosecute with great ardour and success the geological studies which formed his principal relaxation. A commercial connexion with the wine-growing districts of Portugal, leading him to pay occasional visits to Lisbon and Oporto, and to a residence of some extent in the neighbourhood of each, he was naturally induced to give particular attention to the geology of those districts, and between 1832 and 1849 he communicated to the Geological Society four memoirs on the subject, which indicate by their increasing scientific interest the gradual growth of his knowledge and enlargement of his views, and form an excellent sketch of a country hitherto undescribed. In the mean time he had been occupied at intervals in visiting various districts of England, Scotland, and Wales, and had given to the Geological Society a series of papers "On the Geology of the South of Westmoreland;" "On the Bala Limestone;" "On the Silurian Rocks of the South of Westmoreland and the North of Lancashire;" "On the Geology of North Wales;" "On Slaty Cleavage;" "On the Quartz Rock of M'Culloch's Map of Scotland;" and "On the Southern Border of the Highlands of Scotland," which appeared from time to time in the 'Transactions,' 'Proceedings,' and 'Journal' of that Society. In the course of these researches Mr. Sharpe made himself much more intimately acquainted with extinct forms and their relations to existing objects than is the custom with geologists in general; and by this means acquired that high degree of skill in the palæontological determination of the age of rocks which formed the most striking characteristic of his geological labours. As contributions to special subjects of palæontology, may be recorded papers "On a New Species of *Ichthyosaurus*;" "On *Trematis*, a New Genus belonging to the Family of Brachiopodous Mollusca;" "On the Fossil Remains of Mollusca from the Palæozoic Formations of the United States;" "On *Tylostoma*, a proposed genus of Gasteropodous Mollusks;" and "On the Genus *Nerinaea*, with an account of the species found in Portugal;" together with several parts of an important Monograph, which is included among the splendid publications of the Palæontographical Society, entitled "Description of the Fossil Remains of the Mollusca found in the Chalk-Formation of England," 4to, 1853, &c. The only Natural-History paper unconnected with Geology, which I am aware of his having published, is, a short communication printed in the first volume of

the 'Proceedings of the Committee of Science of the Zoological Society,' "On the Luminous Appearance of the Ocean." Nothing can more strikingly evince the activity of his mind and the versatility of his genius than the readiness with which he turned his attention from geological pursuits to grapple with the difficulties of the ancient Lycian inscriptions brought home by Sir C. Fellowes, Captain Spratt, and Professor Forbes, in regard to which the accuracy of his interpretations of an unknown tongue, written in an imperfectly known character, has not, so far as I am aware, been questioned by philologists. Mr. Sharpe was unmarried; he became a Fellow of the Linnean Society in 1828, of the Geological Society in 1829, and of the Royal Society in 1850. In 1853 he was elected Treasurer of the Geological Society; and in February 1856 he succeeded Mr. Hamilton in the office of President. After only three months' tenure of that high scientific position, he met with the melancholy accident which prematurely terminated his active and honourable career.

*Charles Hampden Turner, Esq.*, who became a Fellow of the Linnean Society in 1819, and of the Royal Society in 1821, was chiefly known in connexion with Natural History, from his being the owner of a fine collection of minerals, purchased by him from the late M. Heuland. He died at his seat, Rooksnest Park, near Godstone, Surrey, on the 17th of March, 1856, at the age of 83.

The melancholy list of our losses concludes with the name of *William Yarrell, Esq.*, whose death cannot be recorded without an expression of the deepest regret on the part of a Society of which he had long been so invaluable an adviser and so distinguished an ornament, and on the part also of a large number of its members, who have lost in him a true and faithful friend. Mr. Yarrell was born on the 3rd of June, 1784, in Duke Street, St. James's, where his father and his uncle, Mr. Jones, carried on in partnership the business of newspaper-agents. His school-days were passed at Dr. Nicholas's large establishment at Ealing, where the late General Sale was among his fellow-pupils, together with his cousin, Mr. Edward Jones, his future partner, and where he acquired the character of a quiet and studious boy. In the year 1802 he became a clerk in the banking-house of Messrs. Herries, Farquhar, and Co., but soon left that employ to join his cousin in the business which had previously belonged to their two fathers, and which, at the death of the cousin in 1850, became wholly his own. In the house in Duke Street, and in the corner house of Bury Street and Little Ryder Street, to which the business had

for many years been removed, he passed the entire remainder of his life,—a life combining with the steady pursuit of business, an eager relish for the pleasures of society and the sports of the field, and an ardent attachment to zoological studies. It can hardly be doubted that to his enthusiastic devotion to field sports he was indebted for the first impulse which led to the fame and distinction which he subsequently acquired as a naturalist. His rod and his gun, in the use of both of which, but particularly of the latter, he was a skilful adept, first made him intimately acquainted with the habits and distinctions of the finny and feathered tribes, which in after-life it became his favourite occupation to illustrate. I first became acquainted with him through my brother in the year 1817, long before any of us were connected with the Linnean Society. At this time he had just become a Member of the Royal Institution, and his scientific studies were divided between chemistry and natural history; but he soon relinquished the former and gave himself wholly to the pursuit of the latter. For several years afterwards he contented himself with the patient and laborious collection of the large body of facts which he ultimately turned to so good an account; and it was not until 1825, when he was upwards of forty years of age, that he published his first paper “On the Occurrence of some Rare British Birds.” This paper appeared in the 2nd volume of the ‘Zoological Journal,’ of which he soon afterwards became one of the editors. In the same year he was elected a Fellow of the Linnean Society, and in February 1827 he communicated to us his “Observations on the Tracheæ of Birds, with Descriptions and Representations of several not hitherto figured,” which was published in the 15th volume of our ‘Transactions.’ In 1827 he also communicated to the Royal Society a paper “On the Change of Plumage of some Hen-Pheasants,” which is printed in the volume of the ‘Philosophical Transactions’ for that year. These papers were the precursors of a long series of memoirs and of shorter communications, which have appeared from time to time in the Linnean ‘Transactions,’ ‘Proceedings,’ and ‘Journal;’ in the ‘Transactions’ and ‘Proceedings’ of the Zoological Society; in the ‘Reports of the British Association;’ in the ‘Zoological Journal;’ in the ‘Annals and Magazine of Natural History;’ in the ‘Philosophical Magazine;’ in the ‘Entomological Magazine;’ and in the ‘Zoologist.’ These publications, and the well-known extent of his acquirements, soon made him known to a large circle of zoological friends, to whom he freely contributed his ample stores of knowledge. In 1825 he corresponded with Bewick, to

whom he sent some of the rarer birds to figure in his celebrated work; and about the same time he formed the acquaintance of Sir William Jardine and Mr. Selby. In 1826, on the formation of the Zoological Society, he became one of its original Members, and immediately took an active part in its proceedings, both as a naturalist and as a man of business. His quiet unpretending manners, his varied information, his plain method of stating facts, and the clear precision of his inferences, the straightforward simplicity of his character, and his unvarying command of temper, rendered him on all occasions a most valuable adviser; and when all these traits in his character had become fully known, it was only with reluctance and in accordance with established rules and regulations, that his name was ever omitted from the Council-lists of either the Linnean or the Zoological Societies. Of the latter he for a short time acted as Secretary, and was frequently one of its Vice-Presidents; and he was also for a long period Treasurer of the Entomological Society, of which he was a warm supporter. On the death of Mr. Forster in 1849, he was elected Treasurer of the Linnean Society, and continued to fill that office, I need not say how satisfactorily to the Society, together with that of one of its Vice-Presidents until his death. So early as 1825, Mr. Yarrell had already formed a considerable collection of British Birds and their eggs, which he continued in after-years to increase, adding to them at a later period a collection of British Fishes. These collections served as the basis of his two great works, the one completed in 1836, under the title of 'A History of British Fishes,' and the other in 1843, under that of 'A History of British Birds.' A second edition of the former was published in 1841, and a third edition of the latter in 1856. These two works, which contain the results of his long-continued observations in the fields and in the woods, by the stream, on the coast, and on the open sea, of his patient and unwearied researches in the closet, and of a careful course of reading, form, and will long continue to form, the textbooks of British Naturalists in the two important departments to which they refer. The 'History of British Fishes' is further remarkable as the earliest published, and consequently may be regarded as the model of that fine series of works on the Natural History of the British Islands of which Mr. Van Voorst has been the publisher, and which have contributed so essentially to extend and popularize the study of nature among us. Of the wide popularity of these two 'Histories,' no better proof could be adduced than the fact, which I have the authority and permission of Mr. Van

Voorst to state, that the sum which Mr. Yarrell received on account of them from first to last exceeded £4000. One of his latest contributions to popular zoology was, a chapter "On Marine Fishes," which he presented to his friend and publisher for insertion in the third edition of the entertaining and instructive 'Sea-side Book' of our distinguished Fellow, Dr. Harvey. Of a naturally robust constitution, inured and strengthened by the pursuits of his early life, the advances of age appeared to make but a slight impression on his frame, until a severe attack of fever, in his seventieth year, for some time gave reason to fear for his life. From this, however, he completely recovered, and gave no further signs of decaying health until the beginning of August last, when an attack of giddiness, followed by slight paralysis, again gave some alarm to his friends. In a few days this also passed away, and he resumed his ordinary avocations. On the 26th of that month he attended a Council of the Linnean Society, and appeared nearly in his usual health, but spoke of being restricted in his diet, and complained of a "woolliness" in the brain. On the ensuing Saturday he accompanied a valued friend by sea to Great Yarmouth, where they arrived on the Sunday morning; in the evening he expressed himself much pleased with his voyage, and stated that he had greatly enjoyed the day. After partaking with appetite of a moderate dinner, he retired to rest about ten o'clock, and was soon after attacked with a difficulty of breathing, the continuance of which rendering him fearful, as he stated, "that he should die and no one know of it," he rung his bell. Medical assistance was immediately procured, but was found unavailing. Perfectly conscious until within a few minutes of breathing his last, he died about half-past twelve in the morning of Monday, the 1st of September, in the 73rd year of his age. On the following Monday he was buried in the churchyard of Bayford in Hertfordshire, where his grave is indicated by a simple epitaph, the lines from Wordsworth, as well as his place of burial, having been selected by himself. It is as follows:—"He was the survivor of twelve brothers and sisters, who, with their father and mother, are all placed close to this spot,

first and last,

The earliest summon'd and the longest spared—  
Are here deposited."

His remains were attended to the grave by our President, Mr. Bell, one of his oldest and most intimate friends, by his relatives

and executors, of whom Mr. Van Voorst was one, by our Librarian, Mr. Kippist, and by other Members of the Society, who were desirous of paying this last sad tribute of respect. Since his death, his extensive library of Natural History books, and his valuable collections of British Birds and Fishes have been sold by auction; and the latter have been thus transferred to the British Museum. But his works will convey to posterity a faithful picture of his distinguished merits as a naturalist; while his portrait, by Mrs. Carpenter, the result of a subscription among forty Fellows of the Society in 1839, will continue to adorn our Meeting-Room, and to recall to the minds of our Fellows the memory of a most valuable Member of the Society, and of a thoroughly amiable, estimable, and honourable man.

The titles of his multifarious papers are given at length, and with but few exceptions, in the 'Bibliographia Zoologiæ et Geologiæ' of the Ray Society, and amount to no fewer than seventy. It is proper, however, that I should here enumerate his contributions to our own publications, which are as follows:—

#### I. In our *Transactions*:—

Observations on the Tracheæ of Birds, with Descriptions and Representations of several not hitherto figured.—*Linn. Trans.* xv. 378.

Description of a species of *Tringa*, killed in Cambridgeshire, new to England and Europe.—*Ibid.* xvi. 109.

On the Organs of Voice in Birds.—*Ibid.* xvi. 305.

On a new species of Wild Swan, taken in England, and hitherto confounded with the Hooper.—*Ibid.* xvi. 445.

Description of the Organs of Voice in a new species of Wild Swan (*Cygnus buccinator*, Richards.).—*Ibid.* xvii. 1.

Descriptions of Three British Species of Freshwater Fishes, belonging to the genus *Leuciscus* of Klein.—*Ibid.* xvii. 5.

On the Habits and Structure of the Great Bustard (*Otis tarda* of Linnæus).—*Ibid.* xxi. 155.

#### II. In our *Proceedings*:—

Notice of an Interwoven Mass of Filaments of *Conferva fluviatilis* of extraordinary size.—*Proc. Linn. Soc.* i. p. 65.

#### III. In our *Journal*:—

On the Influence of the Sexual Organ in modifying External Character.—*Journ. Linn. Soc.* i. p. 76.

The Secretary also announced that thirty-one Fellows, two Foreign Members, and one Associate, had been elected since the last Anniversary.

At the election, which subsequently took place, Thomas Bell, Esq. was re-elected President; Francis Boott, Esq., M.D., Treasurer; John Joseph Bennett, Esq., Secretary; and George Busk, Esq. was elected Under- (Zoological) Secretary. The following five Fellows were elected into the Council in the room of others going out: viz. Hugh Falconer, Esq., M.D.; J. D. Hooker, Esq., M.D.; Robert Hudson, Esq.; Robert M'Andrew, Esq.; and Nathaniel Bagshaw Ward, Esq.

The President nominated Francis Boott, Esq., M.D.; Robert Brown, Esq., D.C.L.; Richard Owen, Esq., D.C.L.; and William Wilson Saunders, Esq., Vice-Presidents for the ensuing year.

A Portrait of Thomas Bell, Esq., the President, painted by Mr. Pickersgill, R.A., was presented by the following Fellows, viz. :—

Alexander, R. C., M.D.	Daubeney, C. G. B., M.D.
Ansell, T., M.D.	Dennes, G. E., Esq.
Armitage, Rev. E., M.A.	Dickinson, J., Esq.
Babington, C. Cardale, Esq., M.A.	Dickinson, J. M. A., M.D.
Babington, Rev. Churchill, B.D.	Ewer, W., Esq.
Baird, W., Esq., M.D.	Francis, W., Esq., Ph.D.
Barlow, Rev. J., M.A.	Gaskoin, J. S., Esq.
Bedingfeld, Rev. J.	Gould, J., Esq.
Bennett, J. J., Esq.	Grant, R. E., M.D.
Bentley, R., Esq.	Gray, J. E., Esq., Ph.D.
Blackwall, J., Esq.	Hamilton, E., M.D.
Boott, F., M.D.	Hankey, J. A., Esq.
Borrer, W., Esq.	Hawkes, Rev. H., B.A.
Borrer, W., Jun., Esq., M.A.	Hawkins, E., Esq.
Bowerbank, J. S., Esq.	Henslow, Rev. J. S., M.A.
Brown, R., Esq., D.C.L.	Hogg, J., Esq., M.A.
Buchanan, W., Esq.	Holman, J., Esq., Lieut. R.N.
Buckton, G. B., Esq.	Hooker, Sir W. J., K.H.
Burchell, W. J., Esq., D.C.L.	Hooker, J. D., M.D.
Busk, G., Esq.	Horsfield, T., M.D.
Capel, Rev. G., M.A.	Hudson, R., Esq.
Cole, R., Esq.	Hugo, Rev. T., M.A.
Cuming, H., Esq.	Janson, T. C., Esq.
Darwin, C., Esq., M.A.	Jones, J. D., M.D.



Kippist, R., Esq.	Seaman, B. C. P., Esq.
Knox, A. E., Esq., M.A.	Seemann, B., Esq., Ph.D.
Lee, J., Esq., LL.D.	Sheppard, Major E., R.A.
Lyell, Sir C., M.A., D.C.L.	Solly, R. H., Esq.
Miers, J., Esq.	Spence, W., Esq.
Morson, T. N. R., Esq.	Tagart, Rev. E.
Murchison, Sir R. I., D.C.L.	Taylor, R., Esq.
Peckover, A., Esq.	Thomson, T., M.D.
Reeve, L., Esq.	Van Voorst, J., Esq.
Roots, S., Esq.	Wakefield, R., Esq.
Salmon, J. D., Esq.	Ward, N. B., Esq.
Salter, S. J. A., M.B.	White, Alfred, Esq.
Salter, T., Esq.	Wight, R., M.D.
Salter, T. B., M.D.	Wilkinson, J. S. C., Esq.
Saunders, W. W., Esq.	Yarrell, W., Esq.

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June 2nd, 1857.

Thomas Bell, Esq., President, in the Chair.

Freeman Roper, Esq., was elected a Fellow.

Read, first, a Note "On the irregularity of the return of Swallows and other vernal migratory birds in the present year;" by Thomas Forster, Esq., M.B., F.L.S. (See "Zoological Proceedings," vol. ii. p. 40.)

Read, secondly, "Additional Remarks on an Organ observed in the Wings and Halteres of Insects;" by John Braxted Hicks, Esq., M.D., F.L.S. (See "Transactions," vol. xxii. p. 141.)

Read, thirdly, a Paper "On some peculiar Structures in the Antennæ of Insects;" by John Braxted Hicks, Esq., M.D., F.L.S. (See "Transactions," vol. xxii. p. 147.)

The President announced that the Local Committee at Montreal had, through their Chairman, Sir W. E. Logan, invited the Linnean Society to depute a representative to the approaching meeting of the American Association for the Advancement of Science in that city, and had placed at the disposal of the Society for that purpose one of two free passages to New York or Boston

and back again, given by the Cunard Steam Company; that the invitation had been thankfully accepted; and that Dr. Berthold Seemann, F.L.S., had kindly consented, at the request of the Council, to proceed to America as the representative of the Society.

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June 16th, 1857.

Thomas Bell, Esq., President, in the Chair.

Read, first, a "Catalogue of the *Hymenoptera* collected at Sarawak, in the Island of Borneo, Malacca, and Singapore, by Mr. A. R. Wallace;" by Frederick Smith, Esq.; communicated by W. W. Saunders, Esq., F.L.S. (See "Zoological Proceedings," vol. ii. p. 42.)

Read, secondly, a "Note on the Occurrence of *Rotatoria* in *Vaucheria*;" by Daniel Oliver, Jun., Esq., F.L.S.

Read, thirdly, a Memoir "On the growth and composition of the Ovarium of *Siphonodon*, Griff.;" by Joseph Dalton Hooker, Esq., M.D., F.R.S., F.L.S. (See "Transactions," vol. xxii. p. 133.)

Read, fourthly, a Note "On a Monstrous Development in *Ha-benaria chlorantha*;" by the Rev. John Stevens Henslow, M.A., F.L.S. (See "Botanical Proceedings," vol. ii.)

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On the Characters, Principles of Division, and Primary Groups of the Class MAMMALIA. By Professor OWEN, F.R.S., F.L.S., Superintendent of the Natural History Departments in the British Museum.

[Read February 17th and April 21st, 1857.]

THE class MAMMALIA, the most highly organized of the animal kingdom and that to which we ourselves belong, appears to have been the last class of animals introduced on this planet, and not to have attained plenary development until the tertiary division of geological time.

MAMMALS are distinguished, outwardly, by an entire or partial covering of hair, and (with two exceptions) by teats or mammae—whence the name of the class\*. All Mammals possess mammary glands, and suckle their young: the embryo or fœtus is developed in the womb. Their leading anatomical character is to have lungs, composed of a highly vascular and minutely cellular structure throughout, and suspended freely in a thoracic cavity separated by a muscular and tendinous septum or diaphragm from the abdomen.

\* From *mamma*, a pap. The Platypus and Echidna are the only known exceptions to this rule. The Mare is an apparent one, from the pudendal position of the nipples. The fetal Cetacea show tufts of hair on the muzzle.

Mammals, like Birds, have a heart composed of two ventricles and two auricles, and have warm blood: they breathe quickly; but inspiration is performed chiefly by the agency of the diaphragm; and the inspired air acts only on the capillaries of the pulmonary circulation.

The blood-discs are smaller than in Reptiles, and, save in the Camel-tribe, are circular. The right auriculo-ventricular valve is membranous, at least never entirely fleshy; and the aorta bends over the left, never over the right, bronchial tube. The primary branches of the aorta are given off not immediately after, but at a little distance from, its origin, and there is less constancy in the order of their origin than in Birds: the phrenic arteries, the cœliac axis, and the superior mesenteric artery are always branches of the abdominal aorta, which terminates by dividing beyond the kidneys into the iliac arteries, from which spring both the femoral and ischiadic branches: the caudal or sacro-median artery, which in some long-tailed Mammals assumes the character of the continued trunk of the aorta, never distributes arteries to the kidneys or the legs, as in Birds. The kidneys are nourished, and derive the material of their secretion, exclusively from the arterial system. Their veins are simple, commencing by minute capillaries in the parenchyma and terminating generally by a single trunk on each side in the abdominal vena cava: they never anastomose with the mesenteric veins.

The kidneys are relatively smaller and present a more compact figure than in the other vertebrate classes; their parenchyma is divided into a cortical and medullary portion, and the secreting tubuli terminate in a dilatation of the excretory duct, called the pelvis.

The liver is generally divided into a greater number of lobes than in Birds. The portal system is formed by veins derived exclusively from the spleen and chylopoietic viscera. The cystic duct, when it exists, always joins the hepatic, and does not enter the duodenum separately. The pancreatic duct is commonly single.

The mouth is closed by soft flexible muscular lips: the upper jaw is composed of palatine, maxillary and premaxillary bones, and is fixed; the lower jaw consists of two rami, which are simple or formed by one bony piece, and are articulated by a convex or flat condyle to the base of the zygomatic process, and not to the tympanic element of the temporal bone; the base of the coronoid process generally extends along the space between the condyloid

and the alveolar processes. The jaws of Mammals with few exceptions are provided with teeth, which are arranged in a single row; they are always lodged in sockets, and never ankylosed with the substance of the jaw. The tongue is fleshy, well-developed, with the apex more or less free. The posterior nares are protected by a soft palate, and the larynx by an epiglottis: the rings of the trachea are generally cartilaginous and incomplete behind: there is no inferior larynx. The œsophagus is continued without partial dilatations to the stomach, which varies in its structure according to the nature of the food, or the quantity of nutriment to be extracted therefrom.

The true vertebræ of Mammalia have their bodies ossified from three centres, and present for a longer or shorter period of life a discoid epiphysis at each extremity. They are articulated by concentric ligaments with interposed glairy fluid forming what are called the intervertebral substances; the articulating surfaces are generally flattened, but sometimes, as in the neck of certain Ruminants, they are concave behind and convex in front: such a vertebra, however, may be distinguished from a vertebra of a Reptile, with a similar ball-and-socket structure of the articular surfaces, even when found in a fossil state, and when the test of the articulating medium cannot be applied, by the complete ankylosis or confluence of the annular with the central part or body, and by the large relative size of the canal for the spinal chord. The cervical vertebræ, with one or two exceptions, are seven in number, neither more nor less: the Monotremes, which are the instances commonly opposed to other generalizations, form no exception to this rule. The lumbar vertebræ are more constant and usually more numerous than in other classes of vertebrate animals. The atlas is articulated by concave articular processes to two convex condyles, which are developed from the ex-occipital elements of the last cranial vertebra. The tympanic element of the temporal bone is restricted in function to the service of the organ of hearing, and never enters into the articulation of the lower jaw. The olfactory nerves escape from the cranial cavity through numerous foramina of a cribriform plate. The optic foramina are always distinct from one another.

The scapula is generally an expanded plate of bone; the coracoid, with two (monotrematous) exceptions, appears as a small process of the scapula. The sternum consists of a narrow and usually simple series of bones: the sternal portions of the ribs are generally cartilaginous and fixed to the vertebral portions without

the interposition of a distinct articulation: there are no gristly or bony abdominal ribs or abdominal sternum. The pubic and ischial arches are generally complete, and united together by bony confluence on the sternal aspect, so that the interspace of the two pelvic arches is converted into two holes, called *foramina obturatoria* or *thyroidea*. The sclerotic coat of the eye is a fibrous membrane, and never contains bony plates. In the quantity of aqueous humour and the convexity of the lens Mammals are generally intermediate between Birds and Fishes. The organ of hearing is characterized by the full development of the cochlea with a lamina spiralis: there are three distinct ossicles in the tympanum; the membrana tympani is generally concave externally; the meatus auditorius externus often commences with a complicated external ear, having a distinct cartilaginous basis. The external apertures of the organ of smell are provided with moveable cartilages and muscles, and the extent of the internal organ is increased by accessory cavities or sinuses which communicate with the passages including the turbinated bones.

There are few characters of the osseous system common, and at the same time peculiar, to the class Mammalia. The following may be cited:—

1. Each half or ramus of the mandible consists of one bony piece developed from a single centre: the condyle is convex or flat, never concave. This has proved a valuable character in the determination of fossils.

2. The second or distal bone, called "squamosal," in the bar continued backwards from the maxillary arch, is not only expanded, but is applied to the side-wall of the cranium, and develops the articular surface for the mandible, which surface is either concave or flat\*.

3. The presphenoid is developed from a centre distinct from that of the basisphenoid.

In no other class of vertebrate animals are these osteological characters present.

The cancellous texture of mammalian bone is of a finer and more delicate structure than in Reptiles, and forms a closer network than in Birds. The microscopic radiating cells are relatively smaller and approach more nearly to the spheroid form; but both these histological characters are liable to mislead, if unsupported by more obvious and constant ones, in the interpretation of a fossil.

\* The Wombat is, perhaps, the sole exception to this rule.



*Dental characters.*—The Mammalia, like *Reptilia* and *Pisces*, include a few genera and species that are devoid of teeth; the true ant-eaters (*Myrmecophaga*), the scaly ant-eaters or pangolins (*Manis*), and the spiny monotrematous ant-eater (*Echidna*), are examples of strictly edentulous Mammals. The Ornithorhynchus has horny teeth, and the whales (*Balæna* and *Balænoptera*) have transitory embryonic calcified teeth, succeeded by whalebone substitutes in the upper jaw. The female Narwhal seems to be edentulous, but has the germs of two tusks in the substance of the upper jaw-bones; one of these becomes developed into a large and conspicuous weapon in the male Narwhal, whence the name of its genus *Monodon*.

The examples of excessive number of teeth are presented, in the order *Bruta*, by the priodont Armadillo, which has ninety-eight teeth: and in the Cetaceous order by the Cachalot, which has upwards of sixty teeth, though most of them are confined to the lower jaw; by the common Porpoise, which has between eighty and ninety teeth: by the Gangetic Dolphin, which has one hundred and twenty teeth; and by the true Dolphins (*Delphinus*), which have from one hundred to one hundred and ninety teeth, yielding the maximum number in the class Mammalia.

When the teeth are in excessive number, as in the Armadillos and Dolphins above cited, they are small, equal, or sub-equal, and usually of a simple conical form.

In most other mammals particular teeth have special forms for special uses; thus, the front teeth, from being commonly adapted to effect the first coarse division of the food, have been called cutters or *incisors*; and the back teeth, which complete its comminution, grinders or *molars*; large conical pointed teeth situated behind the incisors, and adapted, by being nearer the insertion of the biting muscles, to act with greater force, are called holders, tearers, laniaries, or more commonly *canines*, from being well developed in the Dog and other Carnivora.

It is peculiar to the class Mammalia to have teeth implanted in sockets by two or more fangs; but this can only happen to teeth of limited growth, and generally characterizes the molars and premolars: perpetually growing teeth require the base to be kept simple and widely excavated for the persistent pulp. In no mammiferous animal does anchylosis of the tooth with the jaw constitute a normal mode of attachment. Each tooth has its peculiar socket, to which it firmly adheres by the close co-adaptation of their opposed surfaces, and by the firm adhesion of the alveolar

periosteum to the organized cement which invests the fang or fangs of the tooth.

True teeth implanted in sockets are confined, in the Mammalian class, to the maxillary, premaxillary, and mandibular or lower maxillary bones, and form a single row in each. They may project only from the premaxillary bones, as in the Narwhal; or only from the lower maxillary bone, as in *Ziphius*; or be limited to the superior and inferior maxillaries and not present in the premaxillaries, as in the true *Ruminantia* and most *Bruta* (Sloths, Armadillos, Orycteropes). In most Mammals teeth are situated in all the bones above mentioned.

The teeth of the Mammalia usually consist of hard unvascular dentine, defended at the crown by an investment of enamel, and everywhere surrounded by a coat of cement.

The coronal cement is of extreme tenuity in Man, Quadrumana and the terrestrial Carnivora; it is thicker in the Herbivora, especially in the complex grinders of the Elephant.

Vertical folds of enamel and cement penetrate the crown of the tooth in the ruminating and many other Ungulata, and in most Rodents, characterizing by their various forms the genera of those orders.

No Mammal has more than two sets of teeth. In some species the tooth-matrix does not develop the germ of a second tooth, destined to succeed one into which the matrix has been converted; such a tooth, therefore, when completed and worn down, is not replaced. The Sperm Whales, Dolphins, and Porpoises are limited to this simple provision of teeth. In the Armadillos and Sloths, the want of generative power, as it may be called, in the matrix is compensated by the persistence of the matrix, and by the uninterrupted growth of the teeth.

In most other Mammalia, the matrix of the first-developed tooth gives origin to the germ of a second tooth, which sometimes displaces the first, sometimes takes its place by the side of the tooth from which it has originated.

All those teeth which are displaced by their progeny are called 'temporary,' deciduous, or milk-teeth; the mode and direction in which they are displaced and succeeded, viz. from above downwards in the upper, from below upwards in the lower, jaw, in both jaws vertically—are the same as in the Crocodile; but the process is never repeated more than once in any mammalian animal. A considerable proportion of the dental series is thus changed; the second or 'permanent' teeth having a size and form as suitable

to the jaws of the adult, as the 'temporary' teeth were adapted to those of the young animal.

Those permanent teeth, which assume places not previously occupied by deciduous ones, are always the most posterior in their position, and generally the most complex in their form. The term 'molar' or 'true molar' is restricted to these teeth. The teeth between them and the canines are called 'premolars;' they push out the milk-teeth that precede them, and are usually of smaller size and simpler form than the true molars.

Thus the class Mammalia, in regard to the times of formation and the succession of the teeth, may be divided into two groups, *monophyodonts*\*, or those that generate a single set of teeth; and the *diphyodonts*†, or those that generate two sets of teeth. But this dental character is not so associated with other organic characters as to indicate natural or equivalent subclasses.

In the Mammalian orders with two sets of teeth, these organs acquire fixed individual characters, receive special denominations, and can be determined from species to species. This individualization of the teeth is eminently significative of the high grade of organization of the animals manifesting it.

Originally, indeed, the names 'incisors,' 'canines,' and 'molars,' were given to the teeth, in Man and certain Mammals, as in Reptiles and Fishes, in reference merely to the shape and offices indicated by these names; but they are now used as arbitrary signs, in a more fixed and determinate sense. In some Carnivora, *e. g.* the front-teeth have broad tuberculate summits, adapted for nipping and bruising, while the principal back-teeth are shaped for cutting, and work upon each other like the blades of scissors. The front-teeth in the Elephant project from the upper jaw, in the form, size and direction of long pointed horns. In short, shape and size are the least constant of dental characters in the Mammalia; and the homologous teeth are determined, like other parts, by their relative position, by their connexions, and by their development.

Those teeth which are implanted in the premaxillary bones, and in the corresponding part of the lower jaw, are called 'incisors,' whatever be their shape or size. The tooth in the maxillary bone, which is situated at or near to the suture with the premaxillary, is the 'canine,' as is also that tooth in the lower jaw, which, in opposing it, passes in front of the upper one's crown when the

\* *μόνος*, once; *φύω*, I generate; *ὀδούς*, tooth.

† *δῖς*, twice; *φύω* and *ὀδούς*. See "Philosophical Transactions," 1850, p. 493.

mouth is closed. The other teeth of the first set are the 'deciduous molars;' the teeth which displace and succeed them vertically are the 'premolars;' the more posterior teeth, which are not displaced by vertical successors, are the 'molars' properly so called.

I have been led, chiefly by the state of the dentition in most of the early forms of both carnivorous and herbivorous Mammalia, which flourished during the eocene tertiary periods, to regard 3 incisors, 1 canine, and 7 succeeding teeth, on each side of both jaws, as the type formula of diphyodont dentition.

Three of the seven teeth may be 'premolars,' and four may be true 'molars;' or there may be four premolars, and three true molars. This difference, as I have elsewhere shown, forms a character of a secondary group or order in the mammalian class\*. The essential nature of the distinction is as follows: true molars are a backward continuation of the first series of teeth; they are developed in the same primary groove of the foetal gum; they are 'permanent' because they are not pushed out by successional teeth—the 'premolars,' called 'dents de remplacement' by Cuvier. Seven teeth developed in the primary groove is, therefore, the typical number of first teeth, beyond the canines. If, as in *Didelphys*, the anterior three develop tooth-germs, which come to perfection in a 'secondary groove,' there are then 3 deciduous teeth, 3 premolars, and 4 true molars: if, as in *Gymnura*, the anterior four of the 'primary' teeth develop tooth-germs, which grow in a secondary groove, there are then 4 deciduous teeth, 4 premolars, and 3 true molars. The first true molar of the marsupial is thus seen to be the homologue of the last milk-molar of the placental.

The *Gymnure*, the Mole, and the Hog are among the few existing quadrupeds which retain the typical number and kinds of teeth. In a young Hog of ten months, the first premolar, *p. 1*, and the first molar, *m. 1*, are in place and use together with the three deciduous molars, *d. 2*, *d. 3*, and *d. 4*; the second molar, *m. 2*, has just begun to cut the gum; *p. 2*, *p. 3*, and *p. 4*, together with *m. 3*, are more or less incomplete, and will be found concealed in their closed alveoli†.

The last deciduous molar, *d. 4*, has the same relative superiority of size to *d. 3* and *d. 2*, which *m. 3* bears to *m. 2* and *m. 1*; and the

\* Outlines of a Classification of the Mammalia, Trans. Zool. Soc. vol. ii. p. 330 (1839).

† I recommend this easily acquired 'subject' to the young zoologist for a demonstration of the most instructive peculiarities of the mammalian dentition. He will see that the premolars must displace deciduous molars in order to rise into place: the molars have no such relations.

crowns of *p. 3* and *p. 4* are of a more simple form than those of the milk-teeth, which they are destined to succeed. When the milk-teeth are shed, and the permanent ones are all in place, their kinds are indicated, in the genus *Sus*, by the following formula:—

$$i. \frac{3-3}{3-3}, \quad c. \frac{1-1}{1-1}, \quad p. \frac{4-4}{4-4}, \quad m. \frac{3-3}{3-3} = 44:$$

which signifies that there are on each side of both upper and lower jaws 3 incisors, 1 canine, 4 premolars, and 3 molars, making in all 44 teeth, each tooth being distinguished by its appropriate symbol, e. g., *p. 1* to *p. 4*, *m. 1* to *m. 3*. This number of teeth is never surpassed in the placental Diphyodont series.

When the premolars and the molars are below this typical number, the absent teeth are missing from the fore part of the premolar series, and from the back part of the molar series. The most constant teeth are the fourth premolar and the first true molar; and these being known by their order and mode of development, the homologies of the remaining molars and premolars are determined by *counting the molars from before backwards*, e. g. 'one,' 'two,' 'three,' and the premolars *from behind forwards*, 'four,' 'three,' 'two,' 'one.' The incisors are counted from the median line, commonly the foremost part, of both upper and lower jaws, outwards and backwards. The first incisor of the right side is the homotype, transversely, of the contiguous incisor of the left side in the same jaw, and vertically, of its opposing tooth in the opposite jaw; and so with regard to the canines, premolars, and molars; just as the right arm is the homotypé of the left arm in its own segment, and also of the right leg of a succeeding segment. It suffices, therefore, to reckon and name the teeth of one side of either jaw in a species with the typical number and kinds of teeth, e. g. the first, second, and third incisors,—the first, second, third, and fourth premolars,—the first, second, and third molars; and of one side of both jaws in any case.

I have been induced to dwell thus long on the dental characters of the class *Mammalia*, because they have not been clearly or accurately defined in any systematic or elementary work on zoology, although an accurate formula and notation of the teeth are of more use and value in characterizing genera in this than in any other class of animals.

I next proceed to review briefly the principal primary divisions of the *Mammalia* hitherto proposed. The best authorities in Natural History have adopted different characters, drawn from different systems of organs, for the primary groups or divisions of the class *Mammalia*.

Aristotle chose the locomotive system, and divided his ZOOTOKA—the equivalent of the Linnean MAMMALIA—into three sections:—1st, DIPODA, or bipeds; 2nd, TETRAPODA, or quadrupeds; and 3rd, APODA, or impeds. The preponderating second group, which includes all the class save the Human-kind and the Whale-tribe, is subdivided into those with claws, and those with hoofs. The unguiculate quadrupeds are again subdivided according to the nature of their teeth; the ungulate quadrupeds, according to the divisions of their hoofs, as *e. g.* into *Polyschidæ*, or multungulates, *Dischidæ*, or bisulcates, and *Aschidæ*, or solidungulates. I need scarcely remark that this, in most respects admirable, system, would have commanded greater attention, and been now recognized as more manifestly the basis of later systems, had its immortal author more technically expressed his appreciation of the law of the subordination of characters; but he applies to each of his groups, whatever their value, the same denomination, viz. *genos*, or genus.

Ray, with a less philosophical appreciation of the extent and nature of the class *Zootoka* or *Mammalia*, arranges his equivalent group of “Viviparous Four-footed Animals” chiefly on the Aristotelian characters; the primary division being into UNGULATE and UNGUICULATE, and the subdivisions being based on locomotive and dental characters.

Linnaeus, restoring the class *Mammalia* to its Aristotelian integrity, primarily subdivides it into UNGUICULATA, UNGULATA, and MUTICA, the latter being the ‘Apoda’ of Aristotle: the secondary groups or orders are founded chiefly on modifications of the dental system.

Cuvier, adopting the same threefold primary division of the class, subdivides it into better and more naturally defined orders, according to various characters derived from the dental, the osseous, generative, and the locomotive systems.

Illiger, in primarily dividing the *Mammalia* into those with free, and those with fettered limbs—the ‘pedes exerti distincti,’ contrasted with the ‘pedes retracti obvoluti,’—made a more unequal and less natural partition than the threefold one of Aristotle; the Seals and the Whales balance all the rest of the class in the Illigerian system. The subdivisions, also, of these primary groups, based exclusively on characters of locomotion, have met with little acceptance beyond some of the schools of Germany.

De Blainville appears first, 1816, to have adopted a character from the reproductive system for the primary division of the *Mammalia*, viz. into the ‘Monodelphes,’ ‘Didelphes,’ and ‘Ornitho-

delphes.' His orders are in the main a return to the Linnean system and nomenclature, with some peculiar views, as *e.g.* of the quadrumanous or primatial affinity of the Sloths, which have never gained acceptance. But his system indicates a clearer appreciation or stronger conviction of the value of the character of parity and imparity in the number of toes of the *Ungulata*, first suggested by Cuvier\*, than was subsequently entertained by the originator of the idea.

The position of the marsupial and monotrematous quadrupeds at the bottom of the class *Mammalia*, and the higher value assigned to the group which they constituted, than that in the 'Règne Animal' of Cuvier, were ideas also in closer conformity with nature. They were, however, but surmises, unsustained by anatomical knowledge; and, as such, failed to carry conviction, or gain acceptance. Nor was it until comparative anatomy had shown that the Marsupials and Monotremes agreed in differing from all other mammals in the absence of a placenta, and of the great commissure of the brain, in certain bird-like characters of the heart†, and from all other diphyodont Mammals in a less number of premolars, and a greater number of true molars,—depending essentially on the retention of a milk-tooth (*m.* 4), which is displaced and changed in the placental diphyodonts,—that the true affinities of the didelphid and ornithodelphid mammals to each other, and their true position in the class *Mammalia*, were finally recognized.

In the 'Systema Vertebratorum,' communicated in 1840 to the Linnean Society by that accomplished and indefatigable zoologist Prince Charles Lucien Bonaparte, the primary subdivision of the Mammalia according to developmental and generative characters is adopted; and the first division or series *Placentalia* is subdivided, agreeably with M. Jourdan's distribution of Mammalia in the Leyden Museum, into the two subclasses *Educabilia* and *Ineducabilia*, the latter including the orders *Bruta*, *Cheiroptera*, *Insectivora* and *Rodentia*, with the common character of 'cerebrum unilobum.' This I regard as the most important improvement in the classification of the Mammalia, which has been proposed since the establishment of the natural character of the implacental or ovo-viviparous division.

Cuvier had early noticed the relation of the Australian mammals, as a small collateral series, to the unguiculate mammals of

\* Ossemens Fossiles, 4to. ed. 1812, p. 9; tom. iii. ed. 1822, p. 72.

† On the Classification of the *Marsupialia*, Zoological Transactions, vol. ii. p. 315 (1839).

the rest of the world, "some," he writes, "corresponding with the *Carnaria*, some with the *Rodentia*, and others again with the *Edentata*\*."

M. Isidore Geoffroy St. Hilaire, in his 'Classification parallèle des Mammifères,' published in 1845, raises the *Marsupialia* to the rank of a distinct class, and literally exemplifies the idea of Cuvier by placing its subdivisions, as orders, in parallel equivalents with the orders of the *Placentalia*.

It does not appear, however, that Cuvier meant to do more than indicate certain relations of analogy; just as the relation of the pedimanous and frugivorous Marsupials to the pedimanous *Quadrumana* of S. America, that of the marsupial *Hyæna* (*Thylacinus*) to the Wolf, of the Flying Petaurist to the Flying Squirrel, of the Wombat to the Beaver, of the Kangaroo to the Ruminant, of the Koala to the phytiphagous Sunbear, of the Opossums to the Shrews, and of the Echidna to the Anteater, &c., had been pointed out by myself. My esteemed friend and colleague Mr. Waterhouse, whilst admitting the justness of some of these comparisons, appended a timely warning, in a valuable note in his comprehensive and excellent history of the *Marsupialia*†, against the mistake to which the young zoologist might be liable, of concluding the analogical groups of the *Marsupialia* and *Placentalia* thus indicated to be of equal rank and value. I have always participated in this conviction of the lower value of the *Implacentalia* as compared with the *Placentalia*; and have used those terms merely as useful collective or general signs of certain modifications of structure, which are associated with the development and non-development of the placenta.

In like manner, when indicating the highest generalization to which I had arrived after comparisons of the dentition of the Mammalia, by the terms 'monophyodont' and 'diphyodont‡,' signifying respectively the single and double set of teeth developed in different groups of the class, I have been careful to guard myself from being misunderstood, as supposing that the monophyo-

\* Règne Animal, ed. 1829, vol. i. p. 174.

† Natural History of the Mammalia, 8vo. 1845, part i. p. 14. I must remark, however, that in stating "by Prof. Owen and some other naturalists, the present section (*Marsupiata*) is ranked as a subclass," the reader, from the peculiarly extended signification given to the term 'Marsupiata,' might be misled. The *Marsupialia* form one of the orders of my subclass *Implacentalia*. See the articles 'Marsupialia' and 'Monotremata,' in the "Cyclopædia of Anatomy," vol. iii. 1841.

‡ Cyclopædia of Anatomy, part xxxvii. 1849. Phil. Trans. 1850, p. 493.



dont *Monotremata*, *Bruta*, and *Cetacea*, formed an equivalent group with the diphyodont bulk of the Mammalia, or that the binary groups, defined by this single dental character, were natural ones.

Nothing more than a passing allusion seems needed to the system of classifying the Mammalia on the modifications of the placenta, originally proposed by Sir Everard Home\*, and since reproduced and modified by a few other naturalists. The group, *e. g.* associated by the character of the discoid placenta, is as little natural as that which would be composed on the basis of the diphyodont dentition, or the unguiculate feet. The association of the *Rodentia* and *Insectivora* with the *Quadrumana*, as in the latest modification of the placentary system†, is not likely to command acceptance. The diffused placenta, as in the Mare, Porpoise, Peccari, Rhinoceros, and Camel, would lead to an equally heterogeneous assemblage. In two well-defined minor groups, *e. g.* the true *Carnivora* and the true *Ruminantia*, there exist characteristic modifications of the placenta, viz. the zonular and cotyledonal respectively; but though the zonular type is common to the *Carnivora*, it is not peculiar to them; it is that of the placenta in the Hyrax and the Elephant, amongst the *Ungulata*. So likewise the cotyledonal type characterizes the placenta of the Sloth among the *Bruta*.

*Primary Divisions of the Mammalia.*—The question or problem of the truly natural and equivalent primary groups of the class *Mammalia* has occupied much of my consideration, and has ever been present to my mind when gathering any new facts in the anatomy of the Mammalia, during dissections of the rarer forms which have died at the Zoological Gardens, or on other opportunities.

The peculiar value of the leading modifications of the mammalian brain, in regard to their association with concurrent modifications in other important systems of organs, was illustrated in detail in the Hunterian Course of Lectures on the Comparative Anatomy of the Nervous System, delivered by me at the Royal College of Surgeons in 1842. The ideas which were broached or suggested, during the delivery of that course, I have tested by every subsequent acquisition of anatomical knowledge, and now feel myself justified in submitting to the judgement of the Linnean Society, with a view to publication, the following fourfold primary division of the mammalian class, based upon the four leading modifications of cerebral structure in that class.

\* Lectures on Comparative Anatomy, vol. iii. 4to. p. 445.

† GERVAIS, Zoologie et Paléontologie Française, 4to. 1853, p. 194.

The brain is that part of the organization which, by its superior development, distinguishes the Mammalia from all the inferior classes of VERTEBRATA; and it is that organ which I now propose to show to be the one that by its modifications marks the best and most natural primary divisions of the class.

In some mammals the cerebral hemispheres are but feebly and partially connected together by the 'fornix' and 'anterior commissure:' in the rest of the class a part called 'corpus callosum' is added, which completes the connecting or 'commissural' apparatus.

With the absence of this great superadded commissure\* is associated a remarkable modification of the mode of development of the offspring, which involves many other modifications; amongst which are the presence of the bones called 'marsupial,' and the non-development of the deciduous body concerned in the nourishment of the progeny before birth, called 'placenta;' the young in all this 'implacental' division being brought forth prematurely, as compared with the rest of the class.

This first and lowest primary group, or subclass, of Mammalia may be termed, from its cerebral character, *LYENCEPHALA*†,—signifying the comparatively loose or disconnected state of the cerebral hemispheres. The size of these hemispheres (fig. 1, A) is such that they leave exposed the olfactory ganglions (a), the cerebellum (c), and more or less of the optic lobes (B); their surface is generally smooth; the anfractuositities, when present, are few and simple.

The next well-marked stage in the development of the brain is where the corpus callosum (indicated in fig. 2, by the dotted lines d, d) is present, but connects cerebral hemispheres as little advanced in bulk or outward character as in the preceding subclass; the cerebrum (A) leaving both the olfactory lobes (a) and cerebellum (c) exposed, and being commonly smooth, or with few and simple convolutions in a very small proportion, composed of the largest members of the group. The mammals so characterized constitute the subclass *LISSENCEPHALA*‡ (fig. 2).

In this subclass the testes are either permanently or temporarily concealed in the abdomen: there is a common external genito-urinary aperture in most; two precaval veins ('superior' or 'anterior venæ cavæ') terminate in the right auricle. The squamosal in most, and the tympanic in many, retain their primitive separation as distinct bones. The orbits have not an entire rim

\* "On the Structure of the Brain in Marsupial Animals," Philos. Trans. 1837, p. 87.

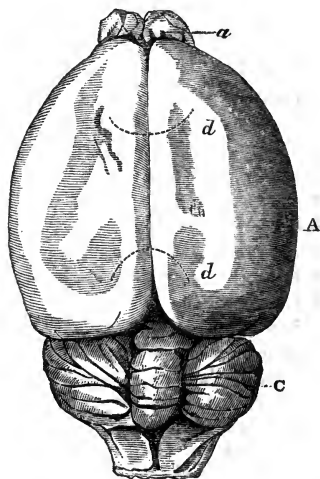
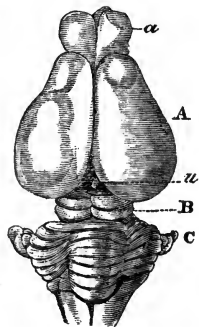
† λύω, to loose; ἐγκέφαλος, brain.

‡ λισσός, smooth; ἐγκέφαλος, brain.

of bone. Besides these more general characters by which the Lissencephala, in common with the Lyencephala, resemble Birds and Reptiles, there are many other remarkable indications of their affinity to the Oviparous Vertebrata in particular orders or genera

Fig. 2.—Brain of Beaver.

Fig. 1.—Brain of Opossum.



of the subclass. Such, *e.g.*, are the cloaca, convoluted trachea, supernumerary cervical vertebræ and their floating ribs, in the 3-toed Sloth; the irritability of the muscular fibre, and persistence of contractile power in the Sloths and some other Bruta; the long, slender, beak-like edentulous jaws and gizzard of the Anteaters; the imbricated scales of the equally edentulous Pangolins, which have both gizzard and gastric glands like the proventricular ones in birds; the dermal bony armour of the Armadillos like that of loricated Saurians; the quills of the Porcupine and Hedgehog; the proventriculus of the Dormouse and Beaver; the prevalence of disproportionate development of the hind-limbs in the *Rodentia*; coupled, in the Jerboa, with confluence of the three chief metatarsals into one bone, as in birds; the keeled sternum and wings of the Bats; the aptitude of the *Cheiroptera*, *Insectivora*, and certain *Rodentia* to fall, like Reptiles, into a state of true torpidity, associated with a corresponding faculty of the heart to circulate carbonized or black blood:—these, and the like indications of co-affinity with the *Lyencephala* to the Oviparous air-breathing Vertebrata, have mainly prevailed with me against an acquiescence

in the elevation of different groups of the Lissencephala to a higher place in the Mammalian series, and in their respective association, through some single character, with better-brained orders, according to Mammalogical systems which, at different times, have been proposed by zoologists of deserved reputation. Such, *e.g.*, as the association of the long-clawed *Bruta* with the *Ungulata*\*, and of the shorter-clawed Shrews, Moles and Hedgehogs, as well as the Bats, with the *Carnivora*†; of the Sloths with the *Quadrumanæ*‡; of the Bats with the same high order§; and of the *Insectivora* and *Rodentia* in immediate sequence after the Linnean 'Primates,' as in the latest published 'System of Mammalogy,' from a distinguished French author||.

\* Macleay, Linn. Trans. vol. xvi. (1833); Gray, Dr. J. E., Mammalia in the British Museum, 12mo. 1843, p. xii.

† Cuvier, Règne Animal, 1829, p. 110.

‡ De Blainville, Ostéographie, 4to. fasc. 1. p. 47 (1839).

§ Linnaeus, Systema Naturæ.

|| Prof. Gervais, Zoologie et Paléontologie Française, 4to. 1852, p. 194. This scheme is avowedly an adoption of that proposed by Professor Milne-Edwards, in the first volume of the 3rd series of the 'Annales des Sciences Naturelles,' 1844, in a paper entitled 'Considérations sur quelques Principes relatifs à la Classification Naturelle des Animaux,' &c.; in referring to which, M. Gervais states his conviction that Milne-Edwards, "a mis hors de doute les rapports des Rongeurs avec les premiers Mammifères."—Annales des Sciences Naturelles, ser. iii. vol. i. p. 251. The high and justly-earned reputation of both these naturalists renders it incumbent on me to state the doubts with respect to the actual affinity of the *Rodentia* to the *Quadrumanæ* which remained on my mind after an attentive perusal of the arguments urged by Milne-Edwards. The first of these arguments is based upon an alleged resemblance of placental structure, expressed by the term "à placenta discoïde," applied as a character to the *Bimana*, *Quadrumanæ*, *Cheiroptera*, *Insectivora* and *Rodentia*, collectively.

The degree of resemblance in outward form, between the placenta of the Rat or Hare, on the one hand, and the *Mycetes* and *Macacus* on the other, seems to me to be more than counterbalanced by the difference of structure. The pedunculate and cotyloid placenta of the Rat consists of foetal parts exclusively; the maternal areolar portion is as distinct from it as it is in the cotyledon of the Ruminant, and is a persistent structure of the uterus. The discoid placenta of the Monkey includes a large proportion of maternal cellular structure, which comes away with the foetal portion. The difference in the organic interblending of the circulatory organs of mother and offspring, between the *Rodentia* and *Quadrumanæ*, is of much more real importance than the degree of superficial similarity. Still more significant, in regard to genetic grounds of affinity, is the great difference in the development and function of the vitellicle or umbilical sac in the foetal membranes of the two orders. But, as regards outward form, the cotyloid placenta of the *Muridæ* differs more from the thin, expanded and subdivided placenta of the Hare, than it does from that of the Marmoset Monkey: then, it signifies something in the argument drawn from similarity

The third leading modification of the Mammalian cerebrum is such an increase in its relative size, that it extends over more or

of form, that there are two distinct discoid placenta in *Callithrix* as in *Cercopithecus*, *Macacus* and *Semnopithecus*; whilst in *Mycetes*, as in *Troglodytes*, there is but one such placenta.

The structure of the discoid placenta in the *Pteropus*, like that of the Rat, more resembles that of the foetal portion of the cotyledon in the Cow than that of the cellulo-vascular spongy placenta of the *Quadrumanus*; and this difference, with the more important one of the larger umbilical sac, appears to me to greatly outweigh the degree of resemblance in mere outward form of the placenta. Any argument in favour of the affinity of the *Cheiroptera* to the *Quadrumanus*, based on that degree of resemblance, must be affected by the prevalence of the double discoid placenta in the *Quadrumanus*. Since Hunter first made known that modification\* in a species of *Macacus*, which, from a comparison of the foetus now preserved in the Museum of the Royal College of Surgeons, I believe to be the 'Wrinkled Baboon' of Shaw (*Macacus rhesus*, Desm.), Professor Breschet has described and figured the two separate discoid placenta in the small South American Squirrel-monkey (*Callithrix sciureus*, Kuhl), in the Green Monkey (*Cercopithecus sabæus*, Desm.), and in the Long-nosed Monkey (*Semnopithecus nasicus*). Yet this well-marked modification of the cellulo-vascular placenta is not constant in the *Quadrumanus*, or even in the primary groups of the order. In the Platyrrhines, e.g., the Howler (*Mycetes seniculus*, Kuhl) has a single placenta, and amongst the Catarrhines, I have ascertained that, in the Chimpanzee (*Troglodytes niger*) the placenta is single, as in the Human subject.

The five flat placental lobes, virtually as distinct as if they were separate placenta, in the Hare, resemble more the subdivided placenta of the Sloth than the single hemispheroid pedunculate placenta of the Rat, or the flattened circular placenta of the Howler Monkey. In short, the observed differences of form in the placenta of the *Rodentia*, *Insectivora*, *Cheiroptera* and *Quadrumanus* by no means justify the use of one general term as applicable to the whole†.

The second argument for the association of the *Insectivora*, *Cheiroptera* and *Rodentia* with the *Quadrumanus* is taken from alleged conformity of cerebral structure.

"Le cerveau d'un Rongeur diffère à peine de celui d'un Insectivore; il existe aussi une ressemblance extrême entre l'encephale d'un Insectivore et celui de certains Quadrumanes;" whence it is meant to be inferred, that there is the same extreme resemblance between the brain in *Rodentia* and certain *Quadrumanus*. In my paper on the 'Brains of the Marsupialia' (Phil. Trans. 1837), I have described and figured (pl. v. p. 93) the brain of a Beaver (see fig. 2, p. 15) and that of a small Monkey (*Midas rufimanus*, fig. 3, p. 19), showing the absence of cerebral convolutions in both. As the cerebral hemispheres have since been shown to be equally smooth in other *Hapalidæ* of Isidore Geoffroy, in the Potto Lemur‡ (*Perodicticus*, Bennett), in *Microcebus*§, and with few and feeble traces of con-

\* Animal Economy, 4to. 1780.

† Annales des Sciences Nat. tom. cit. p. 96.

‡ Bijdrage tot de Kennis van den Potto van Bosman, 4to. 1851, V. der Hoeven.

§ Comptes Rendus de l'Acad. des Sciences, Janvier 19, 1852.

less of the cerebellum; and generally more or less over the olfactory lobes. Save in very few exceptional cases of the smaller and inferior forms of *Quadrumana* (fig. 3), the superficies is folded into more or less numerous gyri or convolutions,—whence the name *GYRENCEPHALA*\*, which I propose for the third subclass of Mammalia (fig. 4).

In this subclass we shall look in vain for those marks of affinity to the *Ovipara*, which have been instanced in the preceding subclasses. The testes are, indeed, concealed, and through an obvious

volutions in *Stenops tardigradus* (Vrolik, Rech. d'Anatomie comparée sur le genre *Stenops*, in N. Verhand. der 1ste Klasse Koninkl. Nederl. Inst. Amsterdam, Oct. 1843); there is, to that extent, in the *Quadrumanous* order, a superficial resemblance to the non-convoluted brains of the *Rodentia* and *Insectivora*; but it is attended by that more important difference in the form and proportions of the cerebral hemispheres, of which I express my estimate by the system of Classification proposed in the present paper.

The smooth hemispheres of the brain of the *Midas* (fig. 3, A) “extend, as in most of the *Quadrumana*, over the greater part of the cerebellum (c)” (Phil. Trans. 1837, p. 93); it resembles, in short, the brain of the Human embryo before the cerebral surface begins to be folded; whereas in the *Insectivora*, in the Beaver, and even in the *Capybara*, in which there are a few shallow anfractuositities, the cerebral hemispheres leave the cerebellum quite exposed.

With regard to the alleged contrast between the brains of the *Rodentia* and *Carnivora*, in the breadth of the anterior and middle part of the cerebral hemispheres, a comparison of the brains of the Beaver and Coatimondi, and of the Porcupine and the Civet Cat, leaves me entirely unable to appreciate the force of the remark.

The third argument for the high position of the *Rodentia*, *Cheiroptera* and *Insectivora* in the Mammalian scale, is deduced from some particulars of their osteology, and principally from the common presence of the clavicle in them, as contrasted with its constant absence in the *Carnivora* and *Ungulata*. The clavicle is present in all *Quadrumana*, but it is not a peculiar characteristic of the higher forms of the Mammalian class. It is much more constant in the class of Birds and Reptiles: it is present in the *Monotremes*, in *Marsupials*, and in most *Bruta*. An affinity of the *Insectivora* and of the clavicate *Rodentia* with a lower vertebrate type, might therefore be inferred from the clavicle, at least with as much reason, as with the Apes and Man. As to the shape of the articular cavity for the mandible, the *Rodentia* differ more from the *Quadrumana* in this particular than the *Carnivora* do; whilst, in respect of the size, form, and persistent individuality of the tympanic bone, the *Rodentia* plainly show their more essential relations to the oviparous type; the *Carnivora* resembling the *Quadrumana* in the early coalescence of the petro-tympanic with the squamosal elements of the temporal bone.

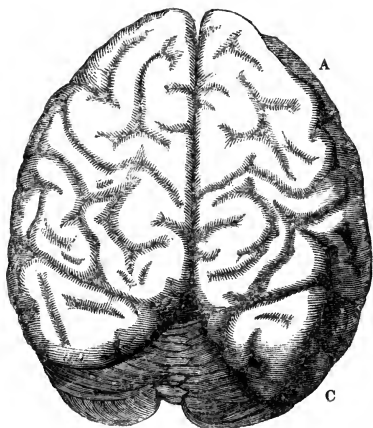
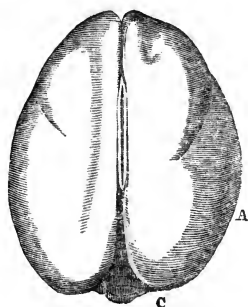
Such are some of the considerations which have induced me to set a different value than M. Gervais does, on the arguments adduced by Prof. Milne-Edwards in favour of an association of the *Rodentia* with the *Quadrumana*, in a highly placed primary group of the Mammalian class.

\* γυρῶ, to bend or wind; ἐγκέφαλος, brain.

adaptive principle, in the Cetacea; but, in the rest of the sub-class, with the exception of the Elephants, they pass out of the abdomen, and the Gyrencephalous quadrupeds, as a general rule, have a scrotum. The vulva is externally distinct from the anus. With

Fig. 4.—Chimpanzee.

Fig. 3.



the exception, again, of the Elephants, the blood from the head and anterior limbs is returned to the right auricle by a single precaval trunk. The mammalian modification of the Vertebrate type attains its highest physical perfections in the *Gyrencephala*, as manifested by the bulk of some, by the destructive mastery of others, by the address and agility of a third order. And, through the superior psychological faculties—an adaptive intelligence predominating over blind instinct—which are associated with the higher development of the brain, the *Gyrencephala* afford those species which have ever formed the most cherished companions and servitors, and the most valuable sources of wealth and power, to Mankind.

In Man the brain presents an ascensive step in development, higher and more strongly marked than that by which the preceding subclass was distinguished from the one below it. Not only do the cerebral hemispheres (figs. 5 & 6, A) overlap the olfactory lobes and cerebellum, but they extend in advance of the one, and further back than the other (fig. 6, C). Their posterior development is so marked, that anatomists have assigned to that part the character of a third lobe; it is peculiar to the genus *Homo*, and

equally peculiar is the 'posterior horn of the lateral ventricle,' and the 'hippocampus minor,' which characterize the hind lobe of each hemisphere. The superficial grey matter of the cerebrum, through the number and depth of the convolutions, attains its maximum of extent in Man.

Peculiar mental powers are associated with this highest form of brain, and their consequences wonderfully illustrate the value of the cerebral character; according to my estimate of which, I am led to regard the genus *Homo*, as not merely a representative of a distinct order, but of a distinct subclass of the Mammalia\*, for which I propose the name of '*ARCHENCEPHALA* †' A (fig. 6).

With this preliminary definition of the organic characters, which appear to

\* Not being able to appreciate, or conceive of the distinction between the psychical phenomena of a Chimpanzee and of a Boschisman, or of an Aztec with arrested brain-growth, as being of a nature so essential as to preclude a comparison between them, or as being other than a difference of degree, I cannot shut my eyes to the significance of that all-pervading similitude of structure—every tooth, every bone, strictly homologous,—which makes the determination of the difference between *Homo* and *Pithecus* the anatomist's difficulty. And, therefore, with every respect for the Author of the "Records of Creation" (8vo, 1816, pp. 18-21), I follow Linnæus and Cuvier in regarding mankind as a legitimate subject of zoological comparison and classification.

† ἀρχω, to overrule; ἐγκέφαλος, brain.

Fig. 5.—Negro.

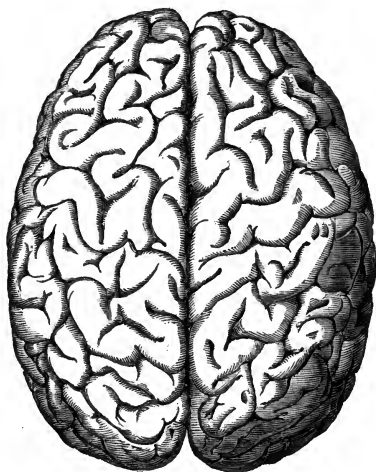
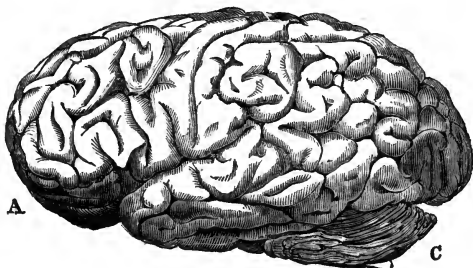


Fig. 6.—Side view, Negro.





guide to a conception of the most natural primary groups of the class *Mammalia*, I next proceed to define the groups of secondary importance, or the subdivisions of the foregoing subclasses.

In the *Lyencephalous Mammalia* some have the 'optic lobes' simple, others partly subdivided, or complicated by accessory ganglions, whence they are called 'bigeminal bodies.' The *Lyencephala* with simple optic lobes are 'edentulous' or without calcified teeth, are devoid of external ears, scrotum, nipples, and marsupial pouch: they are true 'testiconda;' they have a coracoid bone extending from the scapula to the sternum, and also an epicoracoid and episternum, as in Lizards; they are ungiculate and pentadactyle, with a supplementary tarsal bone supporting a perforated spur in the male. The order so characterized is called '*MONOTREMATA*,' in reference to the single excretory and generative outlet, which, however, is by no means peculiar to them among *Mammalia*. The *Monotremes* are insectivorous, and are strictly limited to Australia and Tasmania.

The *MARSUPIALIA* are Mammals distinguished by a peculiar pouch or duplicature of the abdominal integument, which in the males is everted, forming a pendulous bag containing the testes; and in the females is inverted, forming a hidden pouch containing the nipples and usually sheltering the young for a certain period after their birth: they have the marsupial bones in common with the *Monotremes*; a much-varied dentition, especially as regards the number of incisors, but usually including 4 true molars; and never more than 3 premolars\*: the angle of the lower jaw is more or less inverted†.

With the exception of one genus, *Didelphys*, which is American, and another genus *Cuscus*, which is Malayan, all the known existing Marsupials belong to Australia, Tasmania, and New Guinea. The grazing and browsing Kangaroos are rarely seen abroad in full daylight, save in dark rainy weather. Most of the *Marsupialia* are nocturnal. Zoological wanderers in Australia, viewing its plains and scanning its scrubs by broad daylight, are struck by the seeming absence of mammalian life; but during the brief twilight and dawn, or by the light of the moon, numerous forms are seen to

\* "Outlines of a Classification of the Marsupialia," Trans. Zool. Soc. vol. ii. 1839.

† For other Osteological and Dental characteristics of the Marsupialia, see the paper above cited, and that "On the Osteology of the Marsupialia," Trans. Zool. Soc. vol. ii. p. 379 (1838).

emerge from their hiding-places and illustrate the variety of marsupial life with which many parts of the continent abound. We may associate with their low position in the mammalian scale the prevalent habit amongst the Marsupialia of limiting the exercise of the faculties of active life to the period when they are shielded by the obscurity of night.

The Lissencephala or smooth-brained Placentals form a group which I consider as equivalent to the Lyencephala or Implacentals; and which includes the following orders, *Rodentia*, *Insectivora*, *Cheiroptera* and *Bruta*. The RODENTIA are characterized by two large and long curved incisors in each jaw, separated by a wide interval from the molars; and these teeth are so constructed, and the jaw is so articulated, as to serve in the reduction of the food to small particles by acts of rapid and continued gnawing, whence the name of the order. The orbits are not separated from the temporal fossæ. The testes pass periodically from the abdomen into a temporary scrotum, and are associated with prostatic and vesicular glands. The placenta is commonly discoid, but is sometimes a circular mass (Cavy), or flattened and divided into three or more lobes (Lepus). The Beaver and Capybara are now the giants of the order, which chiefly consists of small, numerous, prolific and diversified unguiculate genera, subsisting wholly or in part on vegetable food. Some Rodents, *e. g.* the Lemmings, perform remarkable migrations, the impulse to which, unchecked by dangers or any surmountable obstacles, seems to be mechanical. Many Rodents build very artificial nests, and a few manifest their constructive instinct in association. In all these inferior psychical manifestations we are reminded of Birds. Many Rodents hibernate like Reptiles. They are distributed over all continents.

The transition from the Marsupials to the Rodents is made by the Wombats; and the transition from the Marsupials is made, by an equally easy step, through the smaller Opossums to the INSECTIVORA. This term is given to the order of small smooth-brained Mammals, the molar teeth of which are bristled with cusps, and are associated with canines and incisors: they are unguiculate, plantigrade, and pentadactyle, and they have complete clavicles. The testes pass periodically from the abdomen into a temporary scrotum, and are associated with large prostatic and vesicular glands: like most other *Lissencephala*, the Insectivora have a discoid or cup-shaped placenta. Their place and office in South America and Australia are fulfilled by Marsupialia; but true Insectivora exist in all the other continents.

The order CHEIROPTERA, with the exception of the modification of their digits for supporting the large webs that serve as wings, repeat the chief characters of the Insectivora; but a few of the larger species are frugivorous and have corresponding modifications of the teeth and stomach. The mammæ are pectoral in position, and the penis is pendulous in all Cheiroptera. The most remarkable examples of periodically torpid Mammals are to be found in the terrestrial and volant Insectivora. The frugivorous Bats differ much in dentition from the true Cheiroptera, and would seem to conduct through the Colugos or Flying Lemurs, directly to the Quadrumanous order. The Cheiroptera are cosmopolitan.

The order BRUTA, called *Edentata* by Cuvier, includes two genera which are devoid of teeth; the rest possess those organs, which, however, have no true enamel, are never displaced by a second series, and are very rarely implanted in the premaxillary bones. All the species have very long and strong claws. The ischium as well as the ilium unites with the sacrum; the orbit is not divided from the temporal fossa. I have already adverted to the illustration of affinity to the oviparous Vertebrata which the Three-toed Sloths afford by the supernumerary cervical vertebræ supporting false ribs and by the convolution of the windpipe in the thorax; and I may add that the unusual number—three and twenty pairs—of ribs, forming a very long dorsal, with a short lumbar, region of the spine in the Two-toed Sloth, recalls a laceratine structure. The same tendency to an inferior type is shown by the abdominal testes, the single cloacal outlet, the low cerebral development, the absence of medullary canals in the long bones in the Sloths, and by the great tenacity of life and long-enduring irritability of the muscular fibre, in both the Sloths and Ant-eaters\*.

The order Bruta is but scantily represented at the present period. One genus, *Manis* or Pangolin, is common to Asia and Africa; the *Orycteropus* is peculiar to South Africa; the rest of

\* This latter vital character attracted the notice of the earliest observers of these animals. Thus Marcgrave and Piso narrate of the Sloth:—"Cor motum suum validissimè retinebat, postquam exemptum erat e corpore per semihorium:—exempto corde cæteris visceribus, multò post se movebat et pedes lentè contrahebat sicut dormituriens solet." Buffon, who quotes the above from the 'Historia Naturalis Brasiliæ,' p. 322, well remarks, "Par ces rapports, ce quadrupède se rapproche non seulement de la tortue, dont il a la lenteur, mais encore des autres reptiles et de tous ceux qui n'ont pas un centre du sentiment unique et bien distinct."—Hist. Naturelle, 4to, tom. xiii. p. 45.

the order, consisting of the genera *Myrmecophaga*, or true Ant-eaters, *Dasypus* or Armadillos, and *Bradypus* or Sloths, are confined to South America.

Having defined the orders or subdivisions of the two foregoing subclasses, I may remark that the Lyencephala cannot be regarded as equivalent merely to one of the orders, say *Rodentia*, of the Lissencephala, without undervaluing the anatomical characters which are so remarkable and distinct in the marsupial and monotrematous animals. The anatomical peculiarities of the edentulous Lyencephala\* appear to me to be, at least, of ordinal importance. In these deductions I hold the mean between those who, with Geoffroy St. Hilaire, would make of the *Monotremata* a distinct class of animals, or with De Blainville, a distinct subclass (*Ornithodelphes*) of Mammals†, and those who, with Cuvier, would make the Monotremes a mere family of the *Edentata*, or, with Mr. Waterhouse, a family of the *Marsupiated*‡. In like manner, whilst I regard the Lyencephala (*Marsupiated* of Waterhouse) as forming a group of higher rank than an order, I do not consider it as forming an equivalent primary group to that formed by all the placental Mammalia.

It appears to me that the true value of the Lyencephala or Im-placentalia is that of one of four primary divisions or subclasses of the Mammalia; that its true equivalency is with the Lissencephala, and that all its analogical relations are to be found more truly in that smooth-brained subclass than in the Placentalia at large.

The following Table exemplifies the correspondence of the groups in the Lyencephalous and Lissencephalous series:—

LYENCEPHALA.	LISSENCEPHALA.
<i>Rhizophaga</i> § . . . . .	Burrowing <i>Rodentia</i> .
<i>Poëphaga</i> § . . . . .	<i>Dipodidæ</i> and <i>Leporidæ</i> .
<i>Petaurus</i> . . . . .	<i>Pteromys</i> .
<i>Phalangistidæ</i> . . . . .	<i>Sciuridæ</i> and prehensile-tailed arboreal Rodents.
<i>Phascolarctos</i> . . . . .	<i>Bradypus</i> .
<i>Perameles</i> and <i>Myrmecobius</i>	<i>Erinaceidæ</i> .
<i>Chæropus</i> . . . . .	<i>Macroscelis</i> .

\* See my article *Monotremata*, in the Cyclopædia of Anatomy, part xxvi. 1841.

† Ostéographie, fascicule premier, 4to, 1839, p. 47.

‡ Nat. Hist. of Mammalia, part i. 1845, p. 18.

§ See the 'Classification of the Marsupialia,' in the Zoological Transactions, vol. ii. p. 232.

## LYENCEPHALA.

## LISSENCEPHALA.

<i>Didelphys</i> and <i>Phascogale</i> ..	<i>Soricidæ</i> .
<i>Dasyuridæ</i> .....	<i>Centetes</i> , <i>Gymnura</i> .
<i>Echidna</i> .....	<i>Manis</i> .
<i>Ornithorhynchus</i> .....	<i>Orycteropus</i> .

The classification proposed by M. Gervais, already cited (p. 16), in which the *Rodentia*, *Cheiroptera*, and *Insectivora* are associated in the same high primary group with the *Quadrumanæ* and *Bimana*, is avowedly adopted from that previously proposed by Prof. Milne-Edwards\*.

In next proceeding to consider the subdivisions of the Gyrencephala, we seem at first to descend in the scale in meeting with a group of animals in that subclass, having the form of Fishes; but a high grade of mammalian organization is masked beneath this form. The Gyrencephala are primarily subdivided, according to modifications of the locomotive organs, into three series, for which the Linnean terms may well be retained; viz. *Mutilata*, *Ungulata* and *Unguiculata*, the maimed, the hoofed, and the clawed series.

These characters can only be applied to the Gyrencephalous subclass; *i. e.* they do not indicate natural groups, save in that section of the Mammalia. To associate the Lyencephala and Lissancephala with the unguiculate Gyrencephala into one great primary group, as in the Mammalian systems of Ray, Linnæus and Cuvier, is a misapplication of a solitary character akin to that which would have founded a primary division on the discoid placenta or the diphyodont dentition. No one has proposed to associate the unguiculate Bird or Lizard with the unguiculate Ape; and it is but a little less violation of natural affinities to associate the Monotremes with the Quadrumanes in the same primary (unguiculate) division of the Mammalian class.

The three primary divisions of the Gyrencephala are of higher value than the ordinal divisions of the Lissancephala; just as those orders are of higher value than the representative families of the Marsupials.

The *Mutilata*, or the maimed Mammals with folded brains, are so called because their hind-limbs seem, as it were, to have been amputated; they possess only the pectoral pair of limbs, and these in the form of fins: the hind end of the trunk expands into a broad, horizontally flattened, caudal fin. They have large brains with many and deep convolutions, are naked, and have neither neck, scrotum, nor external ears.

\* See note at p. 16.

The first order, called CETACEA, in this division are either edentulous or monophyodont, and with teeth of one kind and usually of simple form. They are testiconda and have no 'vesiculæ seminales.' The mammæ are pudendal; the placenta is diffused; the external nostrils—single or double—are on the top of the head, and called spiracles or "blow-holes." They are marine, and, for the most part, range the unfathomable ocean; though with certain geographical limits as respects species. They feed on fishes or marine animals.

The second order, called SIRENIA, have teeth of different kinds, incisors which are preceded by milk-teeth, and molars with flattened or ridged crowns, adapted for vegetable food. The nostrils are two, situated at the upper part of the snout; the lips are beset with stiff bristles; the mammæ are pectoral; the testes are abdominal, as in the Cetacea, but are associated with vesiculæ seminales. The Sirenia exist near coasts or ascend large rivers; browsing on fuci, water plants or the grass of the shore. There is much in the organization of this order that indicates its affinity to members of the succeeding division.

In the *Ungulata* the four limbs are present, but that portion of the toe which touches the ground is incased in a hoof, which blunts its sensibility and deprives the foot of prehensile power. With the limbs restricted to support and locomotion, the *Ungulata* have no clavicles: the fore-leg remains constantly in the state of pronation, and they feed on vegetables.

A particular order, or suborder, of this group is indicated by certain South American genera, *e. g.* *Toxodon* and *Nesodon*\*, with long, curved, rootless teeth, having a partial investment of enamel, and with certain peculiarities of cranial structure: the name TOXODONTIA is proposed for this order, all the representatives of which are extinct.

A second remarkable order, most of the members of which have, also, passed away, is characterized by two incisors in the form of long tusks; in one genus (*Dinotherium*) projecting from the under jaw, in another genus (*Elephas*) from the upper jaw, and in some of the species of a third genus (*Mastodon*), from both jaws. There are no canines; the molars are few, large and transversely ridged; the ridges sometimes few and mammillate, often numerous and with every intermediate gradation. The nose is prolonged into a cylindrical trunk, flexible in all directions, highly sensitive, and terminated by a prehensile appendage like a finger: on this organ

\* Philosophical Transactions, 1853, p. 291.

is founded the name *PROBOSCIDIA* given to the order. The feet are pentadactyle, but are indicated only by divisions of the hoof; the testes are abdominal; the placenta is annular\*; the mammæ are pectoral.

Both the present and preceding orders of *Ungulata* may be called aberrant: the dentition of the *Toxodon*, and several particulars of the organization of the Elephant, indicate an affinity to the *Rodentia*; the cranium of the *Toxodon*, like that of the *Dinotherium*, resembles that of the *Sirenia* in its remarkable modifications.

The typical Ungulate quadrupeds are divided, according to the odd or even number of the toes, into *PERISSODACTYLA* and *ARTIODACTYLA*†. In the perissodactyle or odd-toed Ungulata—odd-toed at least in regard to the hind-foot,—the dorso-lumbar vertebræ differ in number in different species, but are never fewer than twenty-two; the femur has a third trochanter; and the medullary artery does not penetrate the fore-part of its shaft. The fore-part of the astragalus is divided into two very unequal facets. The os magnum and the digitus medius which it supports are large, in some disproportionately so, and the digit is symmetrical: the same applies to the ectocuneiform and the digit which it supports in the hind-foot. If the species be horned, the horn is single; or, if there be two, they are placed on the median line of the head, one behind the other, each being thus an odd horn. The nasals expand posteriorly. There is a well-developed post-tympanic process which is separated by the true mastoid from the paroccipital in the Horse, but unites with the lower part of the paroccipital in the Tapir, and seems to take the place of the mastoid in the Rhinoceros and Hyrax. The hinder half, or a larger proportion of the palatines enters into the formation of the posterior nares, the oblique aperture of which commences in advance either of the last molar, or, as in most, of the penultimate one. The pterygoid process has a broad and thick base, and is perforated lengthwise by the ectocarotid. The crown of from one to three of the hinder premolars is as complex as those of the molars‡: that of the last lower milk-molar is commonly bilobed. To these osteological and dental characters may be added some important modifications of internal structure, as, *e.g.* the simple form of the stomach and the capacious and sacculated

\* Besides the annular placenta there is a subcircular villous patch at each pole of the chorionic bag, by which it derived additional attachment to the uterus, in the Elephant.

† From *περισσοδάκτυλος*, qui digitos habet impares numero; and *ἄρτιος*, par, *δάκτυλος*, digitus.

‡ The extinct *Lophiodonts* form the sole known exception to this rule.

cæcum, which equally evince the mutual affinities of the odd-toed or perissodactyle hoofed quadrupeds, and their claims to be regarded as a natural group of the *Ungulata*. The placenta is replaced by a diffused vascular villosity of the chorion in all the recent genera of this order, excepting the little *Hyrax*, in which there is a localised annular placenta, as in the Elephant. But the diffused placenta occurs in some genera of the next group, showing the inapplicability of that character to exact classification. Many extinct genera, *e. g.* *Coryphodon*, *Pliolophus*, *Lophiodon*, *Tapirotherium*, *Palæotherium*, *Ancitherium*, *Hipparion*, *Acerotherium*, *Elasmotherium*, &c., have been discovered, which once linked together the now broken series of Perissodactyles, represented by the existing genera *Rhinoceros*, *Hyrax*, *Tapirus*, and *Equus*.

In the even-toed or 'artiodactyle' Ungulates, the dorso-lumbar vertebræ are the same in number, as a general rule, in all the species, being nineteen. The recognition of this important character appears to have been impeded by the variable number of moveable ribs in different species of the Artiodactyles, the dorsal vertebræ, which those ribs characterize, being fifteen in the Hippopotamus and twelve in the Camel. And the value of this distinction has been exaggerated owing to the common conception of the ribs as special bones distinct from the vertebræ, and their non-recognition as parts of a vertebra equivalent to the neurapophyses and other autogenous elements. The vertebral formulæ of the Artiodactyle skeletons show that the difference in the number of the so-called dorsal and lumbar vertebræ does not affect the number of the entire dorso-lumbar series: thus, the Indian Wild Boar has *d.* 13, *l.* 6=19; the Domestic Hog and the Peccari have *d.* 14, *l.* 5=19; the Hippopotamus has *d.* 15, *l.* 4=19; the Gnu and Aurochs have *d.* 14, *l.* 5=19; the Ox and most of the true Ruminants have *d.* 13, *l.* 6=19; the aberrant Ruminants have *d.* 12, *l.* 7=19. The natural character and true affinities of the Artiodactyle group are further illustrated by the absence of the third trochanter in the femur, and by the place of perforation of the medullary artery at the fore and upper part of the shaft, as in the Hippopotamus, the Hog, and most of the Ruminants. The fore part of the astragalus is divided into two equal or sub-equal facets: the os magnum does not exceed, or is less than, the unciforme in size, in the carpus; and the ectocuneiform is less, or not larger, than the cuboid, in the tarsus. The digit answering to the third in the pentadactyle foot is unsymmetrical, and forms, with that answering to the fourth, a symmetrical



pair. If the species be horned, the horns form one pair or two pairs; they are never developed singly, of symmetrical form, from the median line. The post-tympanic does not project downward distinctly from the mastoid, nor supersede it in any Artiodactyle; and the paroccipital always exceeds both those processes in length. The bony palate extends further back than in the Perissodactyles; the hinder aperture of the nasal passages is more vertical and commences posterior to the last molar tooth. The base of the pterygoid process is not perforated by the ectocarotid artery. The crowns of the premolars are smaller and less complex than those of the true molars, usually representing half of such crown. The last milk-molar is trilobed.

To these osteological and dental characters may be added some important modifications of internal structure, as, *e.g.* the complex form of the stomach in the Hippopotamus, Peccari, and Ruminants; the comparatively small and simple cæcum and the spirally folded colon in all Artiodactyles, which equally indicate the mutual affinities of the even-toed hoofed quadrupeds, and their claims to be regarded as a natural group of the *Ungulata*. The placenta is dif-fused in the Camel-tribe and non-ruminants; is cotyledonal in the true Ruminants. Many extinct genera, *e.g.* *Chæropotamus*, *Anthracotherium*, *Hyopotamus*, *Entelodon*, *Dichodon*, *Merycopotamus*, *Xiphodon*, *Dichobune*, *Anoplotherium*, *Microtherium*, &c., have been discovered, which once linked together the now broken series of Artiodactyles, represented by the existing genera, *Hippopotamus*, *Sus*, *Dicotyles*, *Camelus*, *Auchenia*, *Moschus*, *Camelopardalis*, *Cervus*, *Antilope*, *Ovis*, and *Bos*.

A well-marked, and at the present day very extensive subordinate group of the Artiodactyles, is called *Ruminantia*, in reference to the second mastication to which the food is subject after having been swallowed; the act of rumination requiring a peculiarly complicated form of stomach. The Ruminants have the 'cloven foot,' *i. e.* two hoofed digits on each foot forming a symmetrical pair, as by the cleavage of a single hoof; in most species two small supplementary hoofed toes are added. The metacarpals of the two functional toes coalesce to form a single 'cannon-bone,' as do the corresponding metatarsals. The Camel-tribe have the upper incisors reduced to a single pair; in the rest of the Ruminants the upper incisors are replaced by a callous pad. The lower canines are contiguous, and, save in the Camel-tribe, similar to the six lower incisors, forming part of the same terminal series of eight teeth, between which and the molar series there is a wide

interval. The true molars have their grinding surface marked by two double crescents, the convexity of which is turned inwards in the upper and outwards in the under jaw.

Many fossil Artiodactyles, with similar molars, appear to have differed from the Ruminants chiefly by retaining structures which are transitory and embryonic in most existing Ruminants, as, *e. g.* upper incisors and canines\*, first premolars, and separate metacarpal and metatarsal bones; these are among the lost links that once connected more intimately the Ruminants with the Hog and Hippopotamus.

The Pachyderms in the Cuvierian system included all the non-ruminant hoofed beasts; they were divided by the great French anatomist into the *Proboscidea*, *Solidungula*, and *Pachydermata ordinaria*, the latter again being subdivided according to the odd or even number of the hoofs. I have on another occasion† adduced evidence to show that the right progression of the affinities of the *Ungulata* was broken by the interposition of the Horse and other Perissodactyles between the non-ruminant or omnivorous and ruminant Artiodactyles; and that too high a value had been assigned to the Ruminantia by making them equivalent to all the other Ungulates collectively‡.

\* In a new-born Dromedary (*Camelus Dromedarius*, L.), which perished in the birth at the London Zoological Gardens, the following was the state of the dentition. In the upper jaw there were six deciduous incisors (3—3), which were calcified, and presented a larger proportional size than any rudiments of those teeth that have been noticed in ordinary Ruminants, and they leave conspicuous alveoli in the premaxillaries: the deciduous canine and first functional milk-molar (*d.* 2) were small, the latter with a simple crown; the second (*d.* 3) and third (*d.* 4) molars were large, bilobed, and each lobe was bicrescentic. \* In the lower jaw the six incisors and two canines form a semicircular series of nearly equal teeth, with overlapping leaf-shaped crowns, the deciduous canines more resembling the incisors than the permanent ones do: the functional molars are but two in number, on each side; the first is small, simple, conical, compressed, notched behind; the second is very large and three-lobed, each lobe being bicrescentic, and the last the largest. Only the summits of the crescents of the molar teeth had pierced the gum (Catal. of Osteology, Mus. Roy. Coll. of Surgeons, vol. ii. p. 577, 4to, 1853).

† Quarterly Journal of the Geological Society, December 1847.

‡ Since the communication of my paper on the classification and affinities of the hoofed animals to the Geological Society, Nov. 3, 1847, in which the grounds for the division of the *Ungulata* into two orders, according to the parity or imparity of the digits, as proposed in my 'Odontography,' are given in detail, the idea has been ventilated and more or less adopted by M. Pomel (Comptes Rendus de l'Acad. des Sciences, June 19, 1848), and by M. Gervais (Zoologie et Paléontologie Française, p. 42). The latter experienced palæontologist, extending the term 'Pachydermes' to include all the Ungulates, divides

The third division of the *Gyrencephala* enjoy a higher degree of the sense of touch through the greater number and mobility of the digits, and the smaller extent to which they are covered by horny matter. This substance forms a single plate, in the shape of a claw or nail, which is applied to only one of the surfaces of the extremity of the digit, leaving the other, usually the lower, surface possessed of its tactile faculty; whence the name *Unguiculata*, applied to this group, which, however, is more restricted and natural than the group to which Linnæus extended the term. All the species are 'diphyodont,' and the teeth have a simple investment of enamel.

The first order, CARNIVORA, includes the beasts of prey, properly so called. With the exception of a few Seals, the incisors are  $\frac{3-3}{3-3}$  in number; the canines  $\frac{1-1}{1-1}$ , always longer than the other teeth, and usually exhibiting a full and perfect development as lethal weapons; the molars graduate from a trenchant to a tuberculate form, in proportion as the diet deviates from one strictly of flesh to one of a more miscellaneous kind. The clavicle is rudimental or absent; the innermost digit is often rudimental or absent; they have no vesiculæ seminales; the teats are abdominal; the placenta is zonular. The Carnivora are divided, according to modifications of the limbs, into 'pinnigrades,' 'plantigrades,' and 'digitigrades.' In the Pinnigrades (Walrus, Seal-tribe) both fore and hind feet are short, and expanded into broad, webbed paddles for swimming, the hinder ones being fettered by continuation of integument to the tail. In the Plantigrades (Bear-tribe) the whole or nearly the whole of the hind foot forms a sole, and rests on the ground. In the Digitigrades (Cat-tribe, Dog-tribe, &c.) only the toes touch the ground, the heel being much raised.

It has been usual to place the Plantigrades at the head of the Carnivora, apparently because the higher order, Quadrumana, is plantigrade; but the affinities of the Bear, as evidenced by internal structure, *e. g.* the renal and genital organs, are closer to the Seal-tribe\*; the broader and flatter pentadactyle foot of the planti-

them into 'Pachydermes herbivores' and 'Pachydermes omnivores,' respectively equivalent to my *Perissodactyla* and *Artiodactyla*, which latter terms M. Pomel adopts. M. Gervais writes: "Les pachydermes omnivores se lient d'une manière si intime aux Ruminants par les Chevrotains et les Chameaux, qu'il est devenu impossible de séparer, comme ordre différent de celui des Ruminants l'ensemble de ces Pachydermes, autrefois confondus avec les Pachydermes herbivores."—*Op. cit.* Expl. de Planche xxxvi. p. 6, 4to, 1854.

\* 'Catalogue of the Physiological Series,' Mus. R. Coll. of Surgeons, 4to, vol. ii. 1834, p. 127. Mr. Waterhouse, in noticing the projecting process on the

grade is nearer in form to the flipper of the Seal than is the more perfect digitigrade, retractile-clawed, long and narrow hind foot of the feline quadruped, which is the highest and most typical of the Carnivora.

The next perfection which is superinduced upon the unguiculate limb is such a modification in the size, shape, position, and direction of the innermost digit, that it can be opposed, as a thumb, to the other digits, thus constituting what is properly termed a 'hand.' Those Unguiculates which have both fore and hind limbs so modified, or at least the hind limbs, form the order QUADRUMANA. They have  $\frac{2-2}{2-2}$  incisors\*, and  $\frac{3-3}{3-3}$  broad tuberculate molars†; perfect clavicles, pectoral mammae, vesicular and prostatic glands, a simple or slightly bifid uterus, and a discoid, sometimes double, placenta‡. The Quadrumana have a well-marked threefold geographical as well as structural division. The Strepsirhines are those with curved or twisted terminal nostrils, with much modified incisors, commonly  $\frac{3-3}{3-3}$ ; premolars  $\frac{3-3}{3-3}$  or  $\frac{2-2}{2-2}$  in number, and molars with sharp tubercles; the second digit of the hind limb has a claw. This group includes the Galagos, Pottos, Aye-Ayes, Loris, Indris, and the true Lemurs; the three latter being restricted to Madagascar, whence the group diverges in one direction to the continent of Africa, in the other to the Indian Archipelago. The Platyrrhines are those with the nostrils subterminal and wide apart; premolars  $\frac{3-3}{3-3}$  in number, the molars with blunt tubercles; the thumbs of the fore-hands not opposable or wanting; the tail in most prehensile; they are peculiar to South America. The Catarhines have the nostrils oblique and approximated below, and opening above and behind the muzzle: the premolars are  $\frac{2-2}{2-2}$  in number; the thumb of the fore-hand is opposable. They are restricted to the Old World, and, save a single species on the rock of Gibraltar, to Africa and Asia. The highest organized family of Catarhines is tailless, and offers in the Orang and Chimpanzee the nearest approach to the human type.

under side of the ramus, a little in advance of the angle of the lower jaw in the *Ursidæ*, remarks:—"The same character is also found in many Seals (*Phocidæ*), which in several other respects appear to approach the bears."—Proc. Zool. Soc. Sept. 1839.

\* With few exceptions in the anomalous *Lemuridæ*.

† Reduced to  $\frac{2-2}{2-2}$  in the Marmosets (*Hapale*, *Mydas*).

‡ Among the Platyrrhines, the placenta is single in *Mycetes*, double in *Callithrix*: among the Catarhines, the placenta is double in *Macacus*, *Cercopithecus*, and *Semnopithecus*, single in *Troglodytes*.

The structural modifications in the genus *Homo*,—the sole representative of the *Archencephala*,—more especially of the lower limb, by which the erect stature and bipedal gait are maintained, are such as to claim for MAN ordinal distinction on merely external zoological characters. But as I have already argued, his psychological powers, in association with his extraordinarily developed brain, entitle the group which he represents to equivalent rank with the other primary divisions of the class *Mammalia* founded on cerebral characters. In this primary group Man forms but one genus, *Homo*, and that genus but one order, called BIMANA, on account of the opposable thumb being restricted to the upper pair of limbs. The testes are scrotal; their serous sac does not communicate with the abdomen; they are associated with vesicular and prostatic glands. The penis is pendulous, and the prepuce has a frænum. The mammæ are pectoral. The placenta is a single, subcircular, cellulo-vascular, discoid body.

Man has only a partial covering of hair, which is not merely protective of the head, but is ornamental and distinctive of sex. The dentition of the genus *Homo* is reduced to thirty-two teeth by the suppression of the outer incisor and the first two premolars of the typical series on each side of both jaws, the dental formula being:—

$$i. \frac{2-2}{2-2}, \quad c. \frac{1-1}{1-1}, \quad p. \frac{2-2}{2-2}, \quad m. \frac{3-3}{3-3} = 32.$$

All the teeth are of equal length, and there is no break in the series; they are subservient in Man not only to alimentation, but to beauty and to speech.

The human foot is broad, plantigrade, with the sole, not inverted as in *Quadrumania*, but applied flat to the ground; the leg bears vertically on the foot; the heel is expanded beneath; the toes are short, but with the innermost longer and much larger than the rest, forming a 'hallux' or great toe, which is placed on the same line with, and cannot be opposed to, the other toes; the pelvis is short, broad, and wide, keeping well apart the thighs; and the neck of the femur is long, and forms an open angle with the shaft, increasing the basis of support for the trunk. The whole vertebral column, with its slight alternate curves, and the well-poised, short, but capacious subglobular skull, are in like harmony with the requirements of the erect position. The widely-separated shoulders, with broad scapulæ and complete clavicles, give a favourable position to the upper limbs, now liberated from the service of locomotion, with complex joints for rotatory as well as

flexile movements, and terminated by a hand of matchless perfection of structure, the fit instrument for executing the behests of a rational intelligence and a free will. Hereby, though naked, Man can clothe himself, and rival all native vestments in warmth and beauty; though defenceless, Man can arm himself with every variety of weapon, and become the most terribly destructive of animals. Thus he fulfils his destiny as the supreme master of this earth, and of the lower Creation.

In these endeavours to comprehend how Nature has associated together her mammalian forms, the weary student quits his task with a conviction that, after all, he has been rewarded with but an imperfect view of such natural association. The mammalian class has existed, probably from the triassic, certainly from the lower oolitic period; and has changed its generic and specific forms more than once in the long lapse of ages, during which life-work has been transacted on this planet by animals of that high grade of organization. Not any of the mammalian genera of the secondary periods occur in the tertiary ones. No genus found in the older eocenes (plastic and septarial clays, &c.) has been discovered in the newer eocenes. Extremely few eocene genera occur in miocene strata, and none in the pliocene. Many miocene genera of Mammalia are peculiar to that division of the tertiary series. Species indistinguishable from existing ones begin to appear only in the newer pliocene beds. Whilst some groups, as *e.g.* the Perissodactyles and omnivorous Artiodactyles, have been gradually dying out, other groups, as *e.g.* the true Ruminants, have been augmenting in genera and species.

In many existing genera of different orders there is a more specialized structure, a greater deviation from the general type, than in the answering genera of the miocene and eocene periods; such later and less typical Mammalia do more effective work by their more adaptively modified structures. The Ruminants, *e.g.* more effectually digest and assimilate grass, and form out of it a more nutritive and sapid kind of meat, than did the antecedent more typical or less specialized non-ruminant Herbivora.

The monodactyle Horse is a better and swifter beast of draught and burthen than its tridactyle predecessor the miocene *Hippa-rion* could have been. The nearer to a Tapir or a Rhinoceros in structure, the further will an equine animal be left from the goal in contending with a modern Racer. The genera *Felis* and *Machairodus*, with their curtailed and otherwise modified dentition and

short strong jaws, become, thereby, more powerfully and effectively destructive than the eocene *Hyænodon* with its typical dentition and three carnassial teeth on each side of its concomitantly prolonged jaws could have been.

Much additional and much truer insight has, doubtless, been gained into the natural grouping of the Mammalia since palæontology has expanded our survey of the class; but our best-characterized groups do but reflect certain mental conceptions, which must necessarily relate to incomplete knowledge, and that as acquired at a given period of time. Thus the order which Cuvier deemed the most natural one in the class *Mammalia* becomes the debris of a group, known at a subsequent period to be a more natural order.

We cannot avoid recognizing, in the scheme which I now submit, the inequality which reigns amongst the groups, which our present anatomical knowledge leads us to place in one line or parallel series as orders. I do not mean mere inequality as respects the number and variety of the families, genera, and species of such orders, because the paucity or multitude of instances manifesting a given modification or grade of structure in no essential degree affects the value of such grade or modification.

The order *Monotremata* is not the less ordinally distinct from the *Marsupialia*, because it consists of but two genera, than is the order *Bimana* from that of *Quadrumana*, because it includes only a single genus. So likewise the anatomical peculiarities of the *Proboscidea*, *Sirenia*, and *Toxodontia* call, at least, for those general terms, to admit of the convenient expression of general propositions respecting them; and some of these general propositions are of a value as great as the organic characters of more expanded orders.

There are residuary or aberrant forms in some of the orders, which, to the systematist disagreeably, compel modifications of the characters that would apply to the majority of such orders. The flying Lemurs (*Galeopithecii*), the rodent Lemurs (*Cheiomys*), the slow Lemurs (*Loris*, *Otolicnus*), forbid any generalization as to teeth or nails in the *Quadrumana*, whilst they continue associated with that order by the character of the hinder thumb; which, by the way, they possess in common with the pedimanous Marsupials. The large, volant, frugivorous Bats (*Pteropus*) are equally opposed to the application of a common dental character to the *Cheiroptera*. They are associated with the insectivorous Bats on account of the common external form arising out of the modification of their locomotive

organs for flight, just as the Dugongs and Manatees are associated with the *Cetacea* on account of their resemblance to Fishes arising out of the same modification of the locomotive system for an aquatic existence. The herbivorous *Cetacea* are now separated from the piscivorous *Cetacea* as a distinct order; and with almost as good reason we might separate the frugivorous from the insectivorous *Cheiroptera*; the cases are very nearly parallel.

Nature, in short, is not so rigid a systematist as Man. There are peculiar conditions of existence which she is pleased shall be enjoyed by peculiarly modified mammals; these peculiarities break through the rules of structure which govern the majority of species existing and subsisting under the more general conditions of existence, to which the larger groups of Mammalia are respectively adjusted.

One class of organs seems to govern one order, another class another order; the dental system, which is so diversified in the *Marsupialia* and *Bruta*, is as remarkable for its degree of constancy in the *Rodentia* and *Insectivora*. But, as a general rule, the characters from the dental, locomotive, and placental systems are more closely correlated in the Gyrencephalous orders than in those in the inferior subclasses of the Mammalia.

In the subjoined tabular view of the classification of the Mammalia, the groups below the ranks of orders are inserted merely as illustrations of those orders, not as equivalent subdivisions, or as the most natural subdivisions of those orders, into which it has not been the aim of the present paper to enter.



## TABLE of the Subclasses and Orders of the Mammalia.

CLASS.

SUBCLASS.

ORDER.

## Archencephala\*

BIMANA .....

Homo.

## Ungulata .....

QUADRUMANA.....

Catarrhina.  
Platyrrhina.  
Strepsirrhina.

CARNIVORA.....

Digitigrada.  
Plantigrada.  
Pinnigrada.

ARTIODACTYLA .....

Omnivora.

PERISSODACTYLA ...

Ruminantia.  
Solidungula.

PROBOSCIDA .....

Maliungula.  
Elephas.

TOXODONTIA .....

Dinotherium.  
Toxodon.

SIRENIA .....

Manatus.

CETACEA .....

Halicore.  
Delphinide.

BRUTA.....

Balenide.

CHEIROPTERA.....

Bradyrodide.  
Dasyrodide.

INSECTIVORA .....

Edentula.  
Erugivora.

RODENTIA .....

Insectivora.  
Talpide.

Soricide.

Erinaceide.

Non-clawed.

Clawed.

MARSUPIALIA .....

Rhizophaga.

MONOTREMATA .....

Poëphaga.  
Carpophaga.

Echidna.

Antomophaga.

## MAMMALIA .....

## Gyrencephala†

Ungulata.....

Mutilata .....

## Lisencephala†

## Lyencephala§

\* ἀρχων, to over-rule, ἐγκέφαλος, the brain. † γυρόω, to wind about, ἐγκέφαλος. ‡ λείω, to loose, ἐγκέφαλος.

Description of a new form of Naked-Eyed Medusa (*Thaumantias achroa*), with brief histological details. By T. SPENCER COBBOLD, Esq., M.D. Communicated by the Secretary.

[Read March 17, 1857.]

(Abstract.)

THIS specimen was obtained from the shore of the Firth of Forth, and presented the following characters:—The form and general aspect of the *umbrella* resembles that of the more typical species, being hemispherical, transparent, colourless, smooth, slightly elongated vertically when in a state of rest, the transverse diameter measuring rather more than the third of an inch and becoming much increased during contraction, the length of the disk at the same time being proportionately lessened. The circumferential portion of the *umbrella* is fringed by 24 tentacula of extreme delicacy and unusual length; also by eight ocelli, a circular gastro-vascular canal, and a well-defined shelf-like veil directed inwards. The *tentacula*, while relaxed and motionless, are fully three times the length of the disk, their particular number and arrangement ( $5 \times 4 + 4$ ) also constituting a satisfactory mark of identification. Amplified fifty diameters, they exhibit a finely granular and ringed appearance, analogous to that of the prehensile labiate organs of *Hydroïda*; even with an ordinary pocket-lens indications of knotting may be seen at the extremities of the cirrhi. To the naked eye the tentacular bulbs appear colourless and homogeneous, but under a magnification of 300 diameters linear, the sub-epidermic tissues display numerous closely packed oval or fusiform cells, which refract light very strongly. Near the extremity of the thread, the cells are more cogently developed, and being placed at a right angle to the axis of the filament, appear to stand out from the investing epidermis. At the upper part the tentacula exhibit lateral lines in their interior, denoting the presence of a central canal, the markings becoming more conspicuous near the bulb. Within the bulb the limiting membrane of an otolithic vesicle was discernible, but there were apparently no vibratory movements within the cavity. The *ocelli*, eight in number ( $2 \times 4$ ), are placed round the circular margin of the disk, at intervals between every third tentacle—an arrangement somewhat peculiar. Each ocellus consists of a transparent vesicle containing a round nucleus, and in addition five bright yellow, highly refracting globules, the central and superior one being the largest. The *sub-umbrella* is placed

rather higher than midway between the marginal ring and the convex surface of the disk. The depth of the concavity lessened during contraction, but not uniformly so, it being observed that the upper part remained unaffected to the extent of a third of its area, from the summit downwards, forming, as it were, a *point d'appui* for the development of contractile action throughout the remainder of the membrane. The proboscidiiform *peduncle* has all the features common to the genus. The *gastro-vascular* canals—four radiating and one circumferential—contain two kinds of corpuscles; the smaller are rather less in diameter than human-blood globules, while the larger, apparently mother-cells, are nearly three times greater, possessing nuclei of variable size, but frequently identical in character with the lesser corpuscles. They moved in a moderately rapid and regular manner, their course in the radiating vessels being continuous from one half of the hemisphere to the other. Thus, two vessels carried the particles from the marginal canal, convergingly, to the central point of intercommunication, on the one hand, and two conveyed the same elements from the centre, divergingly, on the other. The *reproductive glands*, four in number, elongated or semiclavate, are placed on the inferior surface of the sub-umbrella, a short way distant from the margin, and in the course of the radiating canals. Each gland was subdivided by one of the radiating vessels traversing its long axis. The subjacent ova at the surface generally displayed an outer cell-wall, with its included transparent albumen, a second membrane surrounding the molecular yolk, and a third constituting the germinal spot, within which were three or four rounded particles, beautifully distinct. Deeper in the organ were similar cells, smaller in size and imperfectly developed, evidently destined to supply the place of those ripe for expulsion.

To facilitate identification, it may be remarked that *Thaumantias inconspicua* has the disk wider and more flattened, purplish-coloured glands and twenty tentacles. *T. punctata* has thirty-two tentacula, and is a larger species, with the umbrella more depressed, and *T. Thomsoni* has but sixteen tentacula. There is no other British species for which *Thaumantias achroa* can be readily mistaken.

On the Irregularity in the Return of Swallows and other vernal migratory Birds, this Season, 1857. By Dr. THOMAS FORSTER, F.L.S. &c.

[Read June 2, 1857.]

As the following facts will probably be interesting to the Linnean Society, I have carefully extracted them from my Journal of Natural History.

The order of arrival of the Swallow tribe has been quite reversed. The Chimney Swallow, *Hirundo rustica*, who usually arrives in Belgium about the 15th of April, made his first appearance early in May, and then only a straggler or two. This species is not yet common, and after a most careful search after Swallows, up to May the 11th, I had not *myself* seen a single specimen: one or two are said to have been observed about the waters of Ixelles.

A straggling Martin, *H. urbica*, was observed by me on the 23rd of April; but I did not see another till the 9th of May, and this species is still very scarce. Today (14th of May) a *few* Swallows may also be seen. In general, both species are by this time very numerous.

The Swift, *H. apus*, who usually arrives in Belgium before the 1st of May, did not appear till the 9th; and yesterday these birds are become common, though much less numerous than last year.

The Sand Martin, *H. riparia*, has not yet arrived.

The Cuckoo has been heard only once or twice, and that in the first week of May.

I find by consulting ancient records that the occasional delay of the arrival of the Swallow was noticed in Greece of old, and it is probably to some occasion of this kind that we may attribute the line in some poet, I believe Aristophanes,

Ἦ Ζεῦ, χελιδὼν ἄρα πότε φαινέσεται;!!!

The absence of west winds on the continent has been no less remarkable, as this wind has always been connected with the return of the Swallow—

“Cum Zephyris, si concedes, et hirundine primâ.”

So says Horace; and the Martin has also been said to come with S.W. breezes. Ovid represents this wind as blowing

“Quum luteum celsâ sub trabe fingit opus.”

The scarcity of all the vernal songsters has likewise been remarked: the season is altogether late and anomalous.

Bruxelles, May 14th, 1857.

Note on a singular case of Colouring of the Human Hair. By  
WILLIAM A. GUY, M.B. Extracted from a Letter addressed  
to the President.

[Read April 7th, 1857.]

A turner of the name of Ford, employed by the Government to turn several thousands of round rulers for the army in the Crimea, presented himself in the laboratory of King's College one day, in great distress. He was called upon to attend a funeral, and was scandalized at his somewhat ridiculous appearance in consequence of the curious green tint of his hair. Our people in the laboratory washed his head with all the common reagents which occurred to them, but without effect. Being informed of this curious fact, and being interested in it as having some sort of bearing on the question of identification, I called on Mr. Ford, and found him in the state described. His hair, which is naturally a light chestnut, was changed, except towards the roots, of a bright yellow-green, with a very decided and curious green tint. His children, whose hair is of a similar tint, were similarly affected. He told me that his hair and that of his family had always been affected in the same way when engaged in turning rulers from the wood known as *green ebony*—a wood, as he says, generally used for that purpose. His wife's hair, which is black, is not subject to any change. The exposed parts of the skin undergo the same change of colour, as does the urine. He also told me that one of his children was born with a very remarkably deep-green tinted skin, which disappeared in time. As one of our porters passes Broad Street, I send you a specimen I have had put up, showing a bit of the wood, a tube-full of turnings, and three specimens of hair—the two on the left showing the natural colour of the hair of Mr. Ford and one of his children, the specimens on the right the same hair discoloured by the wood, and a single specimen from his own head, showing the usual colour at the root, and the green tint towards the points. The appearance of the whole head, and the contrast of the roots with the rest of the hair, are much more striking than the specimen itself might lead you to expect.

King's College, London,  
January 27th, 1857.

Catalogue of the Hymenopterous Insects collected at Sarawak, Borneo; Mount Ophir, Malacca; and at Singapore, by A. R. WALLACE. By FREDERICK SMITH, Assistant in the Zoological Department in the British Museum. Communicated by W. W. SAUNDERS, Esq., F.R.S., F.L.S.

[Read June 16th, 1857.]

Fam. ANDRENIDÆ, *Leach*.

Gen. HALICTUS, *Latr.*

1. HALICTUS CERATINUS. *H. niger*; alis hyalinis; abdomine clavato. *Male*. Length  $3\frac{1}{2}$  lines. Black: the head closely and finely punctured; antennæ as long as the thorax, the flagellum obscurely testaceous beneath; the face covered with griseous pubescence; the mandibles ferruginous at their apex. Thorax closely punctured; the wings hyaline and iridescent, their apex slightly clouded; the nervures and tegulæ testaceous; the legs rufo-testaceous, the tarsi paler, and covered with pale glittering pubescence. Abdomen clavate; the apical margins of the segments with fasciæ of short white pubescence, frequently more or less obliterated; shining and delicately punctured; beneath, the apex of the third segment, and the fourth, entirely clothed with very short whitish pubescence; the abdomen is of a dark rufo-testaceous hue, palest beneath, varying in different individuals.

*Hab.* Borneo (Sarawak).

This remarkable form of *Halictus* occurs at Sierra Leone. I have described a species from that locality, the "*H. clavatus*;" it is a smaller and very distinct species from *H. ceratinus*; in this species the first recurrent nervure is received in the middle of the second submarginal cell.

2. HALICTUS VAGANS. *H. ater*, cinereo-pubescent; abdomine nitido, segmentis intermediis basi fascia albis.

*Female*. Length  $4\frac{1}{2}$  lines. Black: the clypeus produced, the face covered with cinereous pubescence. Thorax closely punctured above; the mesothorax thinly covered with short erect pale pubescence; the post-scutellum with a dense short downy pubescence; the metathorax truncated, and having some irregular coarse striæ at the base above; the wings hyaline and iridescent, the nervures and tegulæ testaceous; the legs with a short yellowish-white downy pubescence. Abdomen delicately punctured, the basal margin of the second and two following segments with a fascia of short yellowish-white pubescence, the apical segment covered with similar pubescence.

This species bears a very striking resemblance to the *Halictus leucozonius* of Europe.

*Hab.* Borneo (Sarawak).

3. *HALICTUS BASALIS*. *H. niger*; alis hyalinis; abdomine clavato, basi ferrugineo.

*Male*. Length 3 lines. Black: the antennæ nearly as long as the thorax, the flagellum fulvous beneath; the face covered with a dense griseous pubescence; the mandibles rufo-piceous. Thorax thinly clothed with pale pubescence; the wings hyaline and iridescent, the nervures pale testaceous; the tibiæ and tarsi pale rufo-testaceous, the latter palest. Abdomen clavate, shining and finely punctured; the first segment and the apical margin of the second, ferruginous; the second and following segments with fasciæ of pale pubescence.

*Hab.* Singapore.

This conspicuous insect might be mistaken at first sight for a variety of "*H. ceratinus*," but in that species the apical margin of the fifth segment of the abdomen, beneath, is straight, or very slightly emarginate at the sides; in the present species it is *deeply emarginate its entire width*.

#### Gen. *NOMIA*, *Latr.*

1. *NOMIA APICALIS*. *N. nigra*, punctata; abdomine nitido, scutello bituberculato; alis apice nigris.

*Male*. Length 5 lines. Black: the head with scattered cinereous pubescence, dense and short on the sides of the face; the clypeus with a longitudinal impression; somewhat swollen on each side; the flagellum testaceous beneath. Thorax closely punctured, subopaque; a line of pale pubescence beneath the scutellum, which is bituberculate; the tegulæ yellowish; the wings hyaline, the nervures testaceous, the costal nervure dark brown; the apex of the anterior wings with a large dark fuscous cloud; the legs with a glittering cinereous pubescence; the posterior tibiæ curved, and dilated at their apex. Abdomen shining and punctured, the apical margins of the segments depressed, the apical half of the depressions impunctate.

*Hab.* Singapore.

2. *NOMIA IRIDESCENS*, *Westw. MS.* *N. nigra*; capite thoraceque punctatis subopacis; faciei pube grisea; pedibus nigris; abdomine fasciis tribus cæruleis; alis hyalinis.

*Female*. Length 4 lines. Black; very closely and finely punctured; the head and thorax with a griseous pubescence, most dense on the face and sides of the metathorax; the clypeus with a central longitudinal carina; the mandibles obscurely ferruginous at the apex; a white line on the posterior margin of the prothorax, which passes on to and surrounds the tubercles; the scutellum bordered with a line of very short white pubescence; the tegulæ pale testaceous; the wings fulvo-hyaline, with the nervures pale ferruginous; the legs clothed with a mixture of dark brown and griseous pubescence, that on the posterior tibiæ within, and on all the tarsi beneath, fulvous; the claw-

joint of the tarsi ferruginous. Abdomen shining, with an obscure violet tinge in certain lights; the apical margins of the second, third and fourth segments with a fascia of bright green or blue-green; beneath, thickly and coarsely punctured.

*Hab.* Malacca, India.

3. *NOMIA ELEGANS*. *N. nigra*; capite thoraceque punctatis subopacis; alis hyalinis; pedibus subferrugineis; abdomine fasciis cæruleo-viridibus pulchriter ornatus.

*Female.* Length 5 lines. Black: the head closely and finely punctured, the clypeus coarsely so, with a central longitudinal depression, subtuberculate on each side; the labrum and mandibles ferruginous, the latter black at their tips; the scape in front, and the apical joints of the flagellum beneath, yellowish. Thorax: shining, with very delicate shallow punctures; a transverse band of pale pubescence at the apical margin of the scutellum; the base of the metathorax with a deep depression which is crossed by a series of short striæ; the sides of the metathorax with a dense pale fulvous pubescence; the legs pale rufo-testaceous, and covered with short glittering pale pubescence; wings subhyaline and iridescent; the nervures testaceous, the costal nervure and the stigma dark fuscous; the apex of the anterior wings slightly clouded. Abdomen smooth and shining, the apical margins of the segments with narrow, vivid blue-green fasciæ.

*Hab.* Malacca.

Most closely resembling the "*Nomia crassipes* ♀," but that insect has the abdomen punctured, and the fasciæ broad, particularly at the apex of the abdomen.

#### Subfam. ANDRENOIDES.

#### Gen. CTENOPLECTRA, *Smith*.

*Head* transverse: *antennæ* inserted in the middle of the face, short, not reaching to the middle of the thorax; the basal joint of the flagellum not narrowed at the base; the second joint of the same length as the first, much narrowed at the base; the three following joints transverse and of equal length, the five apical ones rather longer, of equal length, the apex of the apical joint pointed; the *labrum* transverse, the anterior margin rounded; the *mentum* rather longer than the labium, the former acute at its apex, the latter blunt or rounded; the *labial palpi* 4-jointed, the two basal joints stout and of equal length, the two apical ones shorter and much more slender; the *paraglossæ* about the same length as the palpi; the *maxillary palpi* 6-jointed, the three basal joints stout and of equal length, the three apical joints much more slender, and each in succession shorter than the preceding; the *ocelli* placed in a curve on the vertex. *Thorax*: large and ovate; the *anterior wings* with one marginal and two sub-



marginal cells, the second receiving both the recurrent nervures; *legs* with the femora broad and compressed; the calcaria at the apex of the intermediate tibiæ stout, acute, and bent at the apex, its hinder margin toothed like a fine comb; the inner spine of the posterior calcaria toothed in a similar manner, the teeth much longer, those at the base of the spine longest, decreasing in length to the apex; the posterior tibiæ and basal joint of the tarsi densely covered with long hair; the claws of the tarsi bifid. *Abdomen* subovate, truncated at the base.

This is a very remarkable genus of Bees: it appears to be most nearly allied to the genus *Macropis*; the neuration of the anterior wings is very similar, and the labial and maxillary palpi consist of the same number of joints; the ocelli are placed in a curve, and the posterior legs have a dense clothing or pollen-brush as in that genus.

The beautiful comb with which the posterior tibiæ are furnished is doubtless for the purpose of removing the grains of pollen collected on the hairs which clothe the shanks. (Plate I. details.)

1. CTENOPLECTRA CHALYBEA. *C. capite thoraceque nigris, abdomineque chalybeo, pedibus posterioribus dense pilosis.*

*Female.* Length 6 lines. Head and thorax black: the head closely punctured; the clypeus shining, the punctures more scattered, and with a slight carina in the middle of its base; the scape in front, and the flagellum beneath, rufo-piceous; the mandibles ferruginous at their apex. Thorax opaque-black: the metathorax smooth and shining in the middle of its base, the sides covered with sooty-black pubescence; wings fuscous, palest at their apical margins; the posterior tibiæ and basal joint of the tarsi densely covered with long black pubescence, the inner pectinated calcar pale testaceous-yellow. Abdomen: steel-blue above, black beneath.

*Hab.* Malacca (Mount Ophir).

#### Subfam. DASYGASTRÆ.

#### Gen. MEGACHILE, *Latr.*

1. *Megachile atrata*, *Smith, Cat. Hym.* pt. 1. p. 182.

*Hab.* Borneo (Sarawak); Philippine Islands.

2. *Megachile ornata*, *Smith, Cat. Hym.* 1. p. 183.

*Hab.* Borneo (Sarawak); India.

3. *Megachile umbripennis*, *Smith, Cat. Hym.* pt. 1. p. 175.

*Hab.* Borneo (Sarawak) and Nepal.

4. MEGACHILE AMPUTATA. *M. nigra; capite thoraceque pube fulva vestitis; abdominis segmentis apicalibus fulvo marginatis; pedibus rufis.*

*Female.* Length 7 lines. Black: the head and thorax clothed above with fulvous pubescence, on the cheeks and thorax beneath it is

slightly griseous; the clypeus shining and punctured, with a longitudinal carina in the middle, thinly covered with pubescence; the flagellum fulvous beneath. Thorax: the tegulæ and legs ferruginous; the wings fusco-hyaline, the nervures fusco-ferruginous, brightest towards the base of the wings. Abdomen: the two basal segments clothed with fulvous pubescence, the four apical segments with black; all the segments with a fascia of short fulvous pubescence on their apical margins; beneath, the three basal segments thinly clothed with pale fulvous pubescence, the three apical ones with black.

Allied to, but very distinct from, the *Anthophora rufipes* of Fabricius.

*Hab.* Borneo (Sarawak).

5. *MEGACHILE TUBERCOLATA*. *M. nigra*; capite thoraceque punctatis, mandibulis fortibus et porrectis; clypeo tuberculato; alis fulvo-hyalinis; abdomine totius nigro.

*Female*. Length 10 lines. Black: clothed with black pubescence on the vertex and disk of the thorax, on the abdomen above it is sparing; the clypeus produced in the middle, forming a large prominent tubercle; the mandibles long, very stout and prominent, with a stout bluntish tooth on their inner margin near their base, and having three large teeth at their apex, the apical one acute. The outer margin of the tegulæ ferruginous; the wings fulvo-hyaline, the nervures ferruginous, their apical margins with a fuscous border. Abdomen: the basal segment densely clothed with sooty-black pubescence; beneath, densely clothed with black pubescence.

*Hab.* Borneo (Sarawak).

6. *MEGACHILE ARCHITECTA*. *M. nigra*, nitida et punctata; abdomine pube læte fulva subtus vestito; alis subhyalinis apice nebulosis.

*Female*. Length 6 lines. Black, shining and punctured: the face, cheeks and thorax beneath, thinly clothed with griseous pubescence, the sides of the metathorax densely so; the wings subhyaline, with a fuscous cloud at the apex of the superior pair; the posterior femora and tibiæ with a short fine cinereous pubescence, that on all the tarsi beneath, fulvous. Abdomen subovate and curving upwards, each segment with a deeply impressed transverse line; beneath, densely clothed with long bright fulvous pubescence.

*Hab.* Borneo (Sarawak).

7. *MEGACHILE LUCTUOSA*. *M. nigra* opaca; alis hyalinis; abdomine subtus fulvo; apice pube grisea vestito.

*Female*. Length 6 lines. Opake-black: very closely punctured; the wings hyaline and iridescent, the nervures black; the base of the metathorax with fuscous pubescence, the sides as well as the thorax beneath with griseous; the apical margins of the second, third and fourth segments with narrow fasciæ of whitish pubescence, the two former widely interrupted; the fifth and sixth densely covered

with short, whitish pubescence; beneath, clothed with fulvous pubescence.

*Hab.* Singapore.

8. *MEGACHILE ROTUNDICEPS*. *M. nigra opaca*; alis fulvo-hyalinis, nervuris ferrugineis; abdomine subtus fulgido-argentato vestito.

*Female*. Length 6 lines. Opaque-black: very closely and rather finely punctured; the labrum fringed with ferruginous pubescence; the head nearly orbicular. Thorax: the metathorax clothed with pale fulvous pubescence; the wings fulvo-hyaline, the nervures and tegulæ pale ferruginous. Abdomen with a little fulvous pubescence at the basè; beneath, clothed with glittering silvery pubescence.

*Hab.* Malacca (Mount Ophir).

### Subfam. SCOPULIPEDES.

#### Gen. CERATINA, *Latr.*

1. *Ceratina hieroglyphica*, *Smith, Cat. Hym.* pt. 2. p. 226.

*Hab.* Borneo (Sarawak).

2. *CERATINA FLAVOPICTA*. *C. atra*; capite thoraceque flavo-pictis; abdomine fasciisque flavis.

*Male*. Length 4 lines. Black: the face, inner orbits of the eyes, clypeus, labrum, mandibles, cheeks, scape, and a minute spot above the eyes, yellow. Thorax: the prothorax, two longitudinal lines on the disk of the mesothorax, an epaulet over the tegulæ, a line on each side of the metathorax, a spot beneath the wings, the tubercles and legs, yellow; the coxæ and base of the femora slightly rufo-piceous; the wings subhyaline, the nervures ferruginous. Abdomen: the basal and apical segments, and the apical margins of the other segments, yellow; the entire insect is shining and the abdomen delicately punctured.

*Hab.* Borneo (Sarawak).

This species is closely allied to the *Ceratina hieroglyphica* from India, but is abundantly distinct.

#### Gen. XYLOCOPA, *Latr.*

1. *Xylocopa latipes*.

*Apis latipes*, *Drury, Ill. Exot. Ins.* ii. p. 98.

*Hab.* Borneo (Sarawak), India, Singapore, Ceylon, Philippine Islands, China.

2. *Xylocopa collaris*, *St. Farg. Hym.* ii. p. 189.

*Hab.* Borneo (Sarawak), India, Sumatra, Bengal, Malacca.

3. *XYLOCOPA ÆSTUANS*.

*Apis æstuans*, *Linn. Syst. Nat.* i. p. 961 ♀.

*Hab.* Singapore, India.

4. *Xylocopa verticalis*, *St. Farg. Hym.* ii. p. 195 ♂.

This species I believe to be the male of *X. astuans*.

*Hab.* Singapore, India.

5. *Xylocopa cærulea*, *Fabr. Syst. Piez.* p. 345.

*Hab.* Singapore, Java, East India, China.

6. *Xylocopa Dejeanii*, *St. Farg. Hym.* ii. p. 209.

*Hab.* Borneo, Java.

This I have little doubt is the male of *X. collaris*: I have on several occasions observed that they have been captured at the same time and place.

7. *Xylocopa dissimilis*, *St. Farg. Hym.* ii. p. 180 ♀.

*Hab.* Borneo (Sarawak), China, Madras.

8. *XYLOCOPA INSULARIS*. *X. nigra*; capite thoraceque pube rufo-fusca tectis; alis nigro-fuscis iridescentibus, apice acuminatis; oculis magnis, vertice fere connexis.

*Male.* Length 11 lines. Black: the head and thorax densely clothed with short rufo-fulvous pubescence; the eyes very large and approximating at the vertex; the anterior legs fringed with long black pubescence behind; the intermediate and posterior legs with black pubescence, very long on the posterior tarsi; the disk of the thorax very smooth and shining; the anterior wings pointed at their apex; the wings brown, with a violet and coppery iridescence; the posterior margins palest; the transverse nervure which separates the first and second submarginal cells, obliterated. Abdomen punctured; the basal and lateral margins with a thick fringe of black pubescence, the apical margins of the segments depressed and slightly rufo-piceous.

*Hab.* Borneo (Sarawak).

#### Gen. ANTHOPHORA, *Latr.*

1. *Anthophora zonata*.

*Apis zonata*, *Linn. Syst. Nat.* i. p. 955.

*Hab.* Borneo (Sarawak).

2. *ANTHOPHORA INSULARIS*. *A. nigra*, pube fulva vestita, faciei pube grisea.

*Female.* Length 7 lines. Black: the face, cheeks and thorax beneath clothed with griseous pubescence, that on the thorax above and on the abdomen is fulvous; the fifth segment of the abdomen with a mixture of black hairs; the legs have a fulvous pubescence outside; within it is black, it is also black at the apex of the plantæ of the posterior legs. The mandibles, labrum, anterior margin of the clypeus and a narrow central longitudinal line, a minute spot above the clypeus,

and the flagellum beneath, yellow; the tegulæ yellow, the wings fulvo-hyaline.

*Hab.* Borneo (Sarawak).

This species closely resembles both the *A. vestita* and the *A. concinna*, but is on comparison very distinct.

### Subfam. SOCIALES.

#### Gen. APIS, Linn.

1. *Apis dorsata*, *Fabr. Syst. Piez.* p. 370.

*Hab.* India, Borneo (Sarawak), Malacca.

2. *Apis Indica*, *Fabr. Syst. Piez.* p. 370.

*Hab.* India, Malacca, Borneo.

3. *Apis Perrottetii*, *Guér. Icon. Règ. Anim. Ins.* p. 461.

*Hab.* Borneo (Sarawak). India.

The specimens from Sarawak are of a paler colour than those described by Guérin, but they agree in all the essential specific characteristics, and have the bands of pale pubescence at the base of the segments, as in *A. Perrottetii*; these bands, if the abdomen retracts after death, are hidden beneath the apical margins of the preceding segments.

4. **APIS ANDRENIFORMIS.** *A. nigra lævis nitida*; *alis hyalinis*; *abdomine fasciis albis pubescentibus ornato.*

*Worker.* Length 4 lines. Black: smooth and shining, slightly pilose; the face with a short cinereous pubescence; the metathorax, the coxæ and femora beneath with whitish pubescence; the wings hyaline and iridescent; the basal margin of the second segment of the abdomen slightly rufo-piceous; the basal margins of the third, fourth, fifth and sixth segments with bands of white pubescence; beneath, the three basal segments of the abdomen pale testaceous in the middle.

*Hab.* Borneo (Sarawak). *Oxford Mus. = florea*

This remarkable Honey-Bee has exactly the appearance of an *Andrena*; it does not appear to be a worn specimen; the wings are not torn, and the abdominal bands entire; the eyes are pubescent, but less conspicuously so than in any species I have previously seen.

5. **APIS TESTACEA.** *A. capite thoraceque nigris, abdomine pedibusque pallide testaceis, alis hyalinis.*

*Worker.* Length 8 lines. Head dark fuscous; the ocelli shining, yellow; the extreme base of the scape and the tips of the mandibles, as well as the tongue, of a reddish-yellow; the head covered with rufo-fuscous pubescence, that on the cheeks palest. Thorax fuscous anteriorly, the metathorax, tegulæ and legs pale rufo-testaceous; the thorax and legs with a pale yellowish-white pubescence, intermixed

with a few fuscous hairs on the disk of the mesothorax; the wings hyaline, with the nervures pale testaceous. Abdomen: pale testaceous and densely clothed with short yellowish-white pubescence.

*Hab.* Borneo.

A very distinct species from any hitherto described: its densely pubescent body is a distinguishing characteristic.

### Genus TRIGONA, *Jurine*.

1. TRIGONA VENTRALIS. *T. nigra*; abdomine nigro-piceo; segmento basali supra, abdomine subtus albis.

*Worker.* Length  $1\frac{2}{3}$  line. Head and thorax black; the extreme base of the scape, and the flagellum rufo-fuscous; the tips of the mandibles ferruginous; the clypeus and lower part of the face with a cinereous pile. Thorax: narrower than the head; the mesothorax margined with short whitish pubescence, the outer margin of the tegulæ rufo-piceous; the wings hyaline and iridescent, the nervures dark ferruginous; the apical joints of the tarsi pale; the posterior tibiæ broadly expanded towards their apex, their upper margin thinly fringed with pale hairs, the basal joint of the tarsi clothed with golden pubescence within. Abdomen dark rufo-piceous; the basal segment white, beneath entirely so.

*Hab.* Borneo (Sarawak). Malacca (Mount Ophir).

2. TRIGONA ATRIPES. *T. flavescenti-rufa*; alis dimidio basali fuscis, apicali lacteis, tibiis tarsisque intermediis et posticis nigris.

*Worker.* Length  $2\frac{1}{2}$  lines. Pale reddish-yellow; the flagellum fuscous above; wings reddish-brown, with their apex beyond the stigma milky-white; the intermediate and posterior tibiæ and tarsi black, the apical joints of their tarsi ferruginous; the anterior legs entirely reddish-yellow; the scutellum fringed with fuscous hairs.

*Hab.* Malacca (Mount Ophir).

3. TRIGONA THORACICA. *T. nigra*; thorace obscure ferrugineo, alis flavo-hyalinis, abdomine basi pallide testaceo.

*Worker.* Length  $3\frac{1}{2}$  lines. Black: the scape of the antennæ at the base, the clypeus and mandibles at their base, ferruginous. Thorax: obscurely ferruginous, the legs more or less ferruginous towards their base; the wings flavo-hyaline. Abdomen smooth and shining, pale testaceous at the base.

*Hab.* Singapore. *malacca B.M.*

4. TRIGONA NITDIVENTRIS. *T. nigra*; alis subhyalinis, coxis et unguibus pallide ferrugineis; abdomine supra nitido, nigro, subtus pallide testaceo.

*Worker.* Length  $3\frac{1}{2}$  lines. Black: the extreme base of the scape ferruginous; the wings subhyaline and iridescent, slightly fuscous towards their base, the nervures testaceous; the margins of the thorax

and the scutellum with ochraceous pubescence; the coxæ and claw-joint of the tarsi rufo-testaceous. Abdomen shining black, its extreme base, and beneath entirely, pale testaceous.

*Hab.* Malacca (Mount Ophir).

5. *TRIGONA LÆVICEPS*. *T. nigra*; capite lævi et nitido, antice pube cinerea tecto; thorace nitido, alis subhyalinis, abdomine castaneo-rufo. B. 7m

*Worker.* Length  $1\frac{1}{2}$  line. Head and thorax black: the face, above the insertion of the antennæ, smooth and shining; the antennæ rufo-testaceous; the clypeus with a hoary pubescence; its anterior margin, and also the mandibles, ferruginous. Thorax smooth and shining, the metathorax highly polished; the wings subhyaline and iridescent, the stigma and nervures ferruginous. Abdomen ferruginous, smooth and shining.

*Hab.* Singapore. ? mt. Ophir

6. *TRIGONA APICALIS*. *T. nigra*; clypeo antennisque ferrugineis, parte dimidia basali alarum fusca, apice hyalino. B. M

*Worker.* Length  $2\frac{1}{2}$  lines. Head and thorax black; the abdomen nigro-piceous; the clypeus, and lower parts of the face, testaceous-yellow; the mandibles ferruginous; antennæ pale ferruginous; the head covered with cinereous pile. Thorax: the tegulæ testaceous; the wings from the base to the stigma brown, beyond which they are hyaline; the scutellum covered with short stiff black hairs; the sides, and beneath, with scattered black pubescence; the legs dark rufo-piceous; the posterior tibiæ pale, flattened and widened towards their apex; the outer margin thickly fringed with black pubescence; the disk of the thorax with a cinereous pile; the apex of the abdomen pale rufo-testaceous.

*Hab.* Borneo (Sarawak).

7. *TRIGONA CANIFRONS*. *T. nigra*; facie pube cinerea vestita; alis hyalinis. B. 7

*Worker.* Length  $2\frac{1}{2}$  lines. Black: the face covered with cinereous pile. The thorax thickly covered above with sooty-black pubescence, which is long and tufted on the scutellum; the tegulæ black and shining; the wings hyaline, the nervures testaceous; the posterior tibiæ, with their upper margin, thickly fringed with black hairs. Abdomen shining black.

*Hab.* Borneo (Sarawak).

8. *TRIGONA COLLINA*. *T. nigra*; antennis basi ferrugineis; alis basi fuscis apice albis. B. 7m

*Worker.* Length  $2\frac{1}{4}$  lines. Black: the scape, flagellum beneath, and its apex, as well as the mandibles, ferruginous; the clypeus with a pale testaceous spot in the middle; the wings brown at their base as

far as the stigma, beyond which they are milky-white ; the abdomen obscurely rufo-piceous at the base.

*Hab.* Malacca (Mount Ophir). *Singapore?*

9. *TRIGONA FIMBRIATA*. *T. capite thoraceque femoribus et abdomine basi testaceo-rufis ; tibiis tarsisque intermediis et posticis nigris.*

*Worker.* Length  $3\frac{1}{2}$  lines. Head rufo-testaceous, the face covered with very short ochraceous pubescence, and sprinkled with longer stiff black hairs ; the colour and pubescence of the thorax are similar to that of the head, but the disk is of a rather darker colour, and the black hairs are longer and more rigid ; the intermediate and posterior tibiæ, and the basal joints of their tarsi, black, the former densely covered with black pubescence, and the latter thickly fringed with the same, the posterior tibiæ being very broadly dilated towards their apex ; the wings hyaline, their nervures bright ferruginous. Abdomen : the two basal segments rufo-testaceous, their apical margins, as well as the whole of the following segments, nigro-fuscous.

*Hab.* Singapore.

### Fam. FORMICIDÆ.

Before entering upon the descriptions of the highly interesting collection of Ants made by Mr. Wallace in Borneo, Malacca, and Singapore, a few observations may not be out of place. I am perfectly aware, that in treating upon this family, I can only achieve a very partial success ; our present knowledge, scanty as it is, convinces me that it is simply an impossibility to assimilate the sexes of the exotic Ants correctly, without positive observation of their economy. The sexes of some species, there can be little doubt, at present form the types of apparently very distinct genera ; such indeed are the eccentricities of form in the exotic species, as to outstrip even the widest bounds hitherto conceived to be necessary to allow, for varieties in form, size and colour. A single instance will amply confirm this observation. In the third volume of the 'Transactions of the Entomological Society,' I described eleven species of the genus *Pseudomyrma* ; of one of these I had the opportunity of describing the three sexes, taken in their formicarium by Mr. H. W. Bates, in Brazil. This species, *Pseudomyrma cephalica*, exhibits such a remarkable difference of form in the male, female and worker, that, had they not been obtained in the manner stated, I should unhesitatingly have removed the sexes into two distinct genera. In the male and worker the head is of the ordinary form and proportion, but that of the female is as long as the thorax, with the sides parallel ; it is in fact, if I may use the term, so disproportioned, that no one, I imagine, could have



possibly supposed any relationship to have existed between the female and the other sex.

It is to the *Formicidæ* that Mr. Wallace has made the most valuable additions: the number of new species added to the genus *Polyrhachis* is very important, and that of eight to the *Cryptoceridæ* makes a grand addition to that curious and highly interesting family. The new genus, *Echinopla*, being founded on the examination of workers only, will no doubt hereafter require a revision of the characters laid down, but in describing a collection containing so many novelties such occurrences are almost inevitable.

1. *Formica gigas*, *Latr. Hist. Nat. Fourm.* 105. pl. 2. f. 6 ♂.

*Hab.* Borneo, Malacca, Singapore.

2. *Formica compressa*, *Fabr. Syst. Piez.* p. 396.

*Hab.* Sarawak.

Specimens from Borneo have the legs more or less red, and in some examples the vertex is more or less so.

3. *Formica stricta*, *Jerdon, Madr. Journ. Lit. & Sci.* (1851) p. 123.

*Hab.* Borneo (Sarawak).

4. *Formica smaragdina*, *Fabr. Spec. Ins.* 488 ♀.

*Formica longipes*, *Jerdon, Madr. Journ. Nat. Hist.* 2nd ser. xiii. 104 ♀.

*Formica viridis*, *Kirby, Trans. Linn. Soc.* xii. 477 ♀.

*Hab.* Borneo (Sarawak), Malacca, Sumatra, Celebes, Philippine Islands.

5. *FORMICA FESTINA*. *F. nigra*, nitida; flagello fulvo; thorace subtus, metathorace pedibusque et petiolo pallide ferrugineis; abdomine subtus piceo.

*Female*. Length 9–10 lines. Black and shining; head oblong-quadrate; the mandibles and anterior margin of the face rufo-piceous; the flagellum fulvous. Thorax: beneath, the sides, the metathorax and the legs, pale ferruginous; wings subhyaline, their nervures ferruginous; scale of the abdomen pale ferruginous, ovate and slightly emarginate above; the posterior margins of the segments of the abdomen; above, pale rufo-testaceous; beneath, entirely pale.

*Hab.* Borneo (Sarawak).

This species closely resembles the European species *F. ligniperda*—in fact appears to be the exotic form of that insect.

6. *FORMICA MISTURA*. *F. nigro-picea*, ferrugineo variegata, pubescens; capite opaco, thorace abdomineque nitidis.

*Female*. Length 7 lines. Head black, the vertex and cheeks more or less ferruginous; the head opaque, with the mandibles shining nigro-piceous; the scape attenuated, rufo-testaceous; the clypeus delicately punctured, slightly emarginate in front. Thorax elongate-ovate,

smooth and shining, with ferruginous stains in front and on the sides; the metathorax truncate, with ferruginous spots at its base above; the legs ferruginous, the tibiae and basal joint of the tarsi darkest; the wings flavo-hyaline, the nervures pale rufo-testaceous. Abdomen elongate-ovate, with the margins of the segments and the apex rufo-piceous; the scale ferruginous, with its superior margin very slightly emarginate; the head with a thin fulvous pubescence; the abdomen with a few scattered pale hairs.

*Hab.* Borneo (Sarawak).

7. *FORMICA PILOSA*. *F. nigra*, dense sericea pilosa; squama ovata.

*Worker*. Length 3 lines. Black, covered with a fine cinereous pile: the head large, much wider than the thorax; eyes ovate, placed laterally rather high on the head; the anterior part of the face truncate, the sides produced beyond the anterior margin of the clypeus; a faintly impressed line above the base of the clypeus, which terminates in a shallow fovea on the front. Thorax compressed posteriorly. Abdomen ovate, with a short pale pubescence; the scale narrow, incrassate, and terminating above in a blunt point.

*Hab.* Borneo (Sarawak).

8. *FORMICA RUFICEPS*. *F. nigra*; capite thoraceque antice ferrugineis.

*Worker*. Length 4 lines. Head ferruginous, smooth, shining, and much wider than the thorax; the mandibles and scape black, the apex of the former obscurely ferruginous; the flagellum pale rufo-testaceous. Thorax black, more or less ferruginous anteriorly, much compressed towards the metathorax; the tips of the joints of the legs ferruginous, as well as the tarsi. Abdomen black, smooth and shining; the scale ovate, acuminate at its apex above; the legs and apex of the abdomen with a scattered short pale pubescence.

*Worker minor*, about one-third smaller; only differs otherwise in having the mandibles ferruginous.

*Hab.* Borneo (Sarawak).

This species bears a strong resemblance to the *F. erratica* of Europe.

9. *FORMICA BADIA*. *F. castaneo-fusca*; thorace postice attenuato, abdominis squamula incrassata, abdomine ovato.

*Worker*. Length  $2\frac{1}{2}$ – $3\frac{1}{2}$  lines. Chestnut-brown; head subovate; the eyes ovate, lateral, placed high on the head towards the vertex. Thorax rounded in front, compressed behind; the metathorax obliquely truncated; the scale of the abdomen subconical, incrassate, slightly rounded in front and truncate behind. Abdomen oblong-ovate, the apex fuscous.

*Hab.* Singapore; Borneo (Sarawak).

This species has much the appearance of a species of *Polyergus*; but the mandibles are toothed at the apex: the palpi I have not examined.

10. *FORMICA DILIGENS*. *F.* obscure rufo-picea; antennis, mandibulis, thorace subtus et lateribus, metathorace pedibusque læte rufis; abdomine subtus pallide rufo-testaceo.

*Female*. Length 9 lines. Head shining, dark rufo-piceous; the carinæ at the insertion of the antennæ, the antennæ, the anterior margin of the face and clypeus, and the mandibles, ferruginous. The thorax and legs ferruginous, with the mesothorax above and the scutellum dark rufo-piceous; wings subhyaline, the nervures and tegulæ pale ferruginous. Abdomen shining dark rufo-piceous, beneath pale rufo-testaceous; scale subquadrate, its superior margin slightly emarginate its entire width.

*Hab.* Malacca.

This insect closely resembles the *F. ligniperda*.

11. *FORMICA IRRITANS*. *F.* capite abdomineque nigro-fuscis; antennis, thorace, abdomine, squamula pedibusque ferrugineis.

*Worker*. Length 6 lines. Elongate and slender; head ovate; dark fuscous; the apex of the scape and the flagellum ferruginous; the clypeus and mandibles dark rufo-piceous. The thorax, scale of the abdomen and the legs, ferruginous; the thorax elongate, compressed, with the prothorax very slightly dilated at the sides. The scale of the abdomen incrassate, rounded anteriorly and truncate behind. Abdomen ovate, nigro-fuscous; the entire insect sprinkled with erect pale hairs.

*Worker minor*. Length 3 lines. Only differs in having the antennæ entirely pale ferruginous and the anterior legs stouter.

*Hab.* Malacca; Borneo (Sarawak).

This is probably the worker of *F. diligens*.

12. *FORMICA FERVENS*. *F.* capite abdomineque obscure rufo-piceis, thorace pedibusque pallide ferrugineis.

*Worker*. Length 4 lines. Head nigro-piceous, thorax and legs pale ferruginous; head subopake, with the mandibles and clypeus slightly shining, the latter with scattered punctures; the flagellum pale ferruginous; the anterior margin of the clypeus slightly emarginate. Thorax more or less fuscous in front, compressed behind. Abdomen black and shining, with the apical margins of the segments narrowly testaceous; thinly sprinkled with pale hairs; the scale ovate and ferruginous.

*Hab.* Borneo (Sarawak).

13. *FORMICA GRACILIPES*. *F.* ferruginea, abdomine (basi excepto) obscure rufo-piceo.

*Worker*. Length 2 lines. Pale ferruginous, abdomen dark rufo-piceous; antennæ longer than the body; head ovate, and wider than the thorax, narrowed behind; the eyes black and prominent. Thorax elongate and compressed; the prothorax narrowed into a slender neck;

legs very much elongated, the posterior pair one-third longer than the insect, the tibiæ and tarsi pale testaceous; the abdominal scale incrasate, rounded in front and truncate behind; the abdomen dark rufopiceous, short and ovate; the base more or less pale ferruginous.

*Hab.* Singapore.

14. *FORMICA IRRITABILIS*. *F. capite, thorace et squama sanguineis; pedibusque rufo-fuscis; abdomine fusco-nigra.*

*Worker.* Length 4 lines. Head, thorax, and scale of the abdomen ferruginous, the abdomen black; the scape black, its extreme base and apex, and the flagellum, ferruginous, the latter more or less fuscous above; the vertex with sometimes a fuscous stain; the mandibles nigro-piceous, their apex ferruginous; the thorax compressed behind, and thinly covered, as well as the head, with erect reddish hairs; legs nigro-fuscous, with the base and apex of the joints, or with sometimes the coxæ and base of the femora, and also the apical joints of the tarsi, ferruginous. The scale of the abdomen ovate, terminating in a point above; the apical margins of the segments with a thin fringe of pale reddish-yellow hairs.

*Hab.* Borneo (Sarawak).

15. *FORMICA SEDULA*. *F. capite thorace pedibusque opacis nigris, abdomine castaneo.*

*Worker.* Length 5 lines. Head and thorax opaque-black, the mandibles and legs shining black; the abdomen chestnut-red. The mandibles smooth at their base, and striated at their apex, with five stout teeth, the flagellum fusco-ferruginous; the head deeply emarginate behind; much wider than the thorax; the thorax compressed; the trochanters and apical joints of the tarsi ferruginous. Abdomen ovate and thinly sprinkled with reddish pubescence; the scale subquadrate; emarginate above, and slightly ferruginous; the head and thorax with a few erect black hairs.

*Hab.* Borneo (Sarawak).

Resembles *F. compressa*, but differs in having much stouter legs, in being pubescent, in having the posterior angles of the head more rounded, and in being pubescent.

16. *FORMICA EXASPERATA*. *F. capite thorace abdominisque squama sanguineis; tarsorum unguibus abdominisque basi rufis; thorace compresso.*

*Worker.* Length  $5\frac{1}{2}$  lines. Head and thorax blood-red; sometimes blackish before the insertion of the antennæ, and also a little in front of the anterior stemma; in some examples entirely red; the mandibles black, stout, strongly toothed and punctured; the head deeply emarginate posteriorly, and much wider than the thorax. Thorax: compressed, sometimes with fuscous stains at the sides, with the tibiæ and tarsi more or less fuscous; the head, thorax and legs with a thin scattered pale reddish pubescence. Abdomen: black, subopaque,

with the apical margins of the segments usually more or less rufo-piceous; the scale erect, ovate and entire.

*Hab.* Borneo (Sarawak).

The general form of this species is that of *F. compressa*; the antennæ are shorter, with shorter joints, and the legs are considerably stouter.

*Hab.* Borneo (Sarawak).

17. *FORMICA TENUIPES*. *F. castaneo-rufa lævis nitida*; thorace ovato; alis hyalinis; squama quadrata supra emarginata.

*Female*. Length 4 lines. Reddish-brown: mandibles stout, and armed with five stout black teeth; antennæ pale rufo-testaceous. Thorax ovate, smooth and shining; wings hyaline, the nervures pale testaceous; legs pale rufo-testaceous, with the femora much compressed, flattened; the scale of the abdomen quadrate, emarginate above. Abdomen ovate, smooth and shining.

*Hab.* Borneo (Sarawak).

18. *FORMICA CAMELINA*. *F. nigra, elongata et gracilis*; capite postice in collum angustato; thorace medio compresso; metathorace supra rotundato; pedibus elongatis; abdominis nodo globoso.

*Worker*. Length 5 lines. Black: elongate and slender; covered with a fine silky pile, which has a golden tinge on the thorax and abdomen; the antennæ nearly as long as the body; the head oblong, much narrowed behind the eyes, the latter nearly round, and placed rather forwards on the face a little higher than the insertion of the antennæ; the carinæ above the clypeus with a less elevated one between them, the antennæ inserted at the sides of the carinæ. Thorax: much narrowed in front, forming a sort of neck, widened and rounded behind, broader than the meso- and meta-thorax, the latter somewhat swollen above and elevated above the anterior part of the thorax; legs very long and sprinkled with fine whitish hairs. The scale of the abdomen, viewed above, pear-shaped, broadest at the base; abdomen ovate, pointed at the apex, and sprinkled with pale glittering hairs.

*Hab.* Singapore.

19. *FORMICA PALLIDA*. *F. pallide testacea lævis nitida sparse pilosa*; squamula elongato-ovata.

*Worker*. Length  $2\frac{1}{2}$ –3 lines. Pale rufo-testaceous, smooth and shining; the head much wider than the thorax, the vertex widely and deeply emarginate; the mandibles dark rufo-piceous; the flagellum and the legs paler than the rest of the body; the thorax compressed behind; the scale narrow and ovate; abdomen subglobose, and thinly sprinkled with long pale hairs; the head and thorax also slightly pubescent.

*Hab.* Borneo (Sarawak).

Some individuals of this species differ from the form described, in having the head and abdomen of a deeper hue; the prothorax is sometimes

dark, but all have the scale of the same elongate-ovate form, without any notch above.

20. *FORMICA IRRITANS*. *F. nigra*; antennis, thorace pedunculisque squama ferrugineis.

*Worker*. Length 6 lines. Head and abdomen nigro-fuscous; antennæ, thorax, and scale of the abdomen, as well as the legs, ferruginous. Elongate and slender, the head ovate; the apex of the scape ferruginous; the clypeus and mandibles dark rufo-piceous. The thorax elongate, compressed, with the prothorax slightly dilated at the sides. Abdomen ovate: the scale incrassate, rounded anteriorly, and truncate behind; the entire insect thinly sprinkled with erect, long, pale pubescence.

*Worker* (minor). Length 3 lines. This only differs in having the antennæ entirely pale ferruginous.

*Hab.* Borneo (Sarawak).

This is probably the worker of *Formica diligens*.

#### Genus *TAPINOMA*, *Foerster*.

1. *TAPINOMA GLABRATA*. *T. nigra*, subnitida, glabra, angustior; antennis, mandibulis tarsisque rufo-pallidis; squama oblonga depressa; abdomine oblongo-ovato.

*Worker*. Length  $1\frac{1}{2}$  line. Black: the clypeus obscurely testaceous; the mandibles and flagellum rufo-testaceous, the apex of the latter slightly fuscous; the head, prothorax, and coxæ beneath, rufo-testaceous; the thorax declining above to the base of the metathorax, the latter convex; the tarsi pale rufo-testaceous. Abdomen ovate; the scale inclining forwards in a line with the oblique truncation of the metathorax; the insect entirely destitute of pubescence.

*Hab.* Malacca.

#### Genus *POLYRHACHIS*.

*Body* more or less armed with spines. *Antennæ* elongate, usually nearly as long as the body; *labial palpi* 4-jointed, the basal joint shortest, the three following, each in succession, longer than the preceding; the apical joint three times the length of the basal one. *Maxillary palpi* 6-jointed, elongate, the basal joint short, about half the length of the second joint, each of the following joints more than twice the length of the second joint. *Thorax*: subovate in the females; compressed and frequently flattened above in the workers; *wings* as in *Formica ligniperda*. *Abdomen* globose. (Details, Plate I.)

This genus of Ants, of which the *Formica bihamata* may be regarded as the type, forms a very distinct section of the *Formicidæ*: the males I am not acquainted with. The habit of these insects is arboreal, as we learn from Mr. Jerdon, who, in his paper on Ants, in the Madras Journal, describes two species; of

one, *P. nidificans*, he says, "This Ant makes a small nest about half an inch or rather more in diameter, of some papyraceous material, which it fixes on a leaf; I have opened two, each of which contained one female and eight or ten workers. It is very rare; I have only seen it in Malabar." What can be the use of the formidable spines and hooks with which these creatures are armed, it is impossible to determine; on examination we find, as might be expected in species living on trees, and probably all have the same habit, that the legs are destitute of spines, and usually of pubescence also; the calcaria at the apex of the tibiae are very short, and the tips of the tarsal joints have very short spines and hairs.

The *Polyrhachis textor*, described in these papers, was captured with its nest, and was sent from Malacca by Mr. Wallace; the nest is nearly oval, not quite an inch in length, its shortest diameter being a little over half an inch; this nest is not of a papyraceous texture, but fibrous, formed, as it were, of a coarse network; the colonies must consequently be very small, as Mr. Jerdon says, consisting of only eight or ten individuals; but probably at the height of the season, when the males appear, the nests may be somewhat enlarged, as we know to be the case amongst the social Wasps.

Although these insects are usually rare, or at least seldom met with in collections, Mr. Wallace has captured no less than nineteen species in the East: from the New World I have only seen one or two, about four from Africa, and the same number from Australia.

1. POLYRHACHIS BIHAMATUS, *Drury, Ins. ii. pl. 38. f. 8* ♂.

*P. thorace quadrispinoso, squama petiolaris spinis duabus arcuatis.*

*Hab.* Borneo. India. Sumatra.

2. *Polyrhachis relucens.*

*Formica relucens, Latr. Hist. Nat. Fourm. p. 131.*

*Hab.* Borneo (Sarawak). India.

3. *Polyrhachis carinatus.*

*Formica carinata, Fabr. Syst. Piez. 413. 71; St. Farg. Hym. i. 220. 28; Jerdon, Madras Journ. Lit. & Sc. (1851).*

*Hab.* Malacca. Singapore.

4. POLYRHACHIS DEFENSUS. *P. niger*; capite thoraceque minute verrucatis, thorace spinis duabus longis antice, duabus postice, armato; abdomine opaco ferrugineo-rufo.

*Worker.* Length  $3\frac{1}{2}$  lines. Head and thorax black, and coarsely sha-

greened; the thorax armed with two long stout spines at the angles of the prothorax, and two similar ones at the posterior angles of the metathorax; the scale of the abdomen with two long stout spines diverging and curved backwards. Abdomen globose, of a dull opaque rusty-red.

*Hab.* Singapore. Java.

Specimens from Java, in the British Museum, have the abdomen black.

5. **POLYRHACHIS CONSTRUCTOR.** *P. niger*; thorace ovato, spinis duabus minutis antice armato; abdominis squamula spinis duabus armata.

*Female.* Length  $3\frac{1}{2}$  lines. Black: finely rugose; the palpi pale testaceous; the mandibles obscurely rufo-piceous; the apex of the antennæ pale rufo-testaceous. Thorax: the anterior angles of the prothorax acute; the metathorax not toothed; the apex truncate, the truncation finely rugose; wings subhyaline, faintly yellow; the nervures pale testaceous. Abdomen globose; the scale quadrate, with two very stout, short, curved spines above; the insect is very thinly covered with a fine short silky ashy pile, most apparent on the abdomen.

*Hab.* Borneo (Sarawak).

6. **POLYRHACHIS RUFICORNIS.** *P. niger*; antennis mandibulis pedibusque ferrugineis, abdominis squamula spinis duabus longis armata.

*Female.* Length 4 lines. Black: the antennæ and mandibles ferruginous. Thorax elongate-ovate; wings subhyaline and iridescent, the nervures testaceous; the legs ferruginous, the coxæ black. Abdomen: the base more or less ferruginous; the scale with two stout divergent spines above, which curve slightly backwards.

*Hab.* Borneo (Sarawak).

7. **POLYRHACHIS CARBONARIUS.** *P. aterrimus*, nitidus; capite thoraceque supra aciculatis, abdominis squamula supra fornicata.

*Worker.* Length 2 lines. Jet-black, shining; the head and the thorax above, longitudinally aciculate, the thorax most finely so. Thorax: the anterior margin of the thorax with a short acute spine at the lateral angles; the truncation of the metathorax smooth and shining; the legs elongate, with acute spines or hairs; the calcaria pale testaceous; the anterior tibiæ obscurely ferruginous in front. Abdomen ovate, smooth and shining; the scale incrassate, narrowed to a sharp edge above, the superior margin wide and arched, not spined.

*Hab.* Malacca.

8. **POLYRHACHIS TEXTOR.** *P. niger*; thorace elongato, supra planato, dentibus duobus parvis antice et postice armato; abdominis pedunculo unispinoso.

*Worker.* Length  $3\frac{1}{2}$  lines. Black; delicately rugulose; the eyes ovate, lateral, placed high on the sides of the head; the front with two raised carinæ, at the sides of which the antennæ are inserted; the



clypeus and the space between the antennæ, rufo-piceous; the clypeus with a slight longitudinal carina; the mandibles obscurely rufo-piceous at their apex; the apical joint of the antennæ ferruginous. Thorax elongate, compressed at the sides, and flattened above; the anterior portion longitudinally aciculate; the meso- and meta-thorax delicately rugulose; a short blunt tooth or spine on each side of the prothorax, and a similar, but more acute tooth at the superior angles of the metathorax; the legs elongate, without spines or hairs; the tips of the claw-joint of the tarsi ferruginous. Abdomen smooth and shining; the peduncle with a single acute spine above, and a minute tooth on each side at its base.

*Hab.* Malacca.

9. *POLYRHACHIS CHALYBEUS*. *P. capite thoraceque nigris, pedibus abdomineque chalybeis.*

*Worker.* Length 4 lines. Black: the metathorax, legs and abdomen steel-blue; the head delicately rugulose; eyes ovate, lateral, placed high on the head; the antennæ inserted opposite the lower orbit of the eyes, each at the side of an elevated bent carina; the clypeus emarginate anteriorly; the mandibles large and stout, their apex denticulate. Thorax elongate, delicately transversely rugulose, with two stout acute spines in front, diverging outwardly, and two shorter erect parallel ones on the metathorax; the femora and tibiæ compressed. Abdomen smooth and shining; the peduncle armed with two long stout divergent bent spines which curve backwards.

*Hab.* Singapore. Malacca.

10. *POLYRHACHIS NITIDUS*. *P. nigerrimus, lævis, nitidus; thorace ovato, metathorace spinis duabus longis acutis, pedunculo quadrato, spinis duabus curvatis acutis armato.*

*Female.* Length 4 lines. Jet-black, smooth and shining; the thorax rounded anteriorly; the metathorax armed with two long acute spines at its base; the truncation delicately transversely rugulose and shining; the peduncle quadrate, armed above at its posterior angles with two short curved acute spines; the anterior tibiæ rufo-piceous in front; wings subhyaline, faintly tinted with yellow; the nervures ferruginous; the stigma brown. Abdomen subglobose, very smooth and shining.

*Hab.* Borneo (Sarawak).

11. *POLYRHACHIS VILLIPES*. *P. niger; thorace spinis duabus elongatis acutis antice armato; abdominis squamula spinis duabus longis acutis, singulis basi minute unispinosis, pedibus pubescentibus.*

*Worker.* Length  $3\frac{1}{2}$ –4 lines. Black: the head and thorax longitudinally delicately aciculate; eyes ovate, very prominent, situated high on the sides of the head, the head narrowed posteriorly; the carinae on the face much elevated; the palpi pale rufo-testaceous. Thorax: armed in front with two long acute divergent spines; posteriorly unarmed; the superior surface flattened, distinctly divided by two trans-

verse sutures, and having a curved decline to the verge of the truncation of the metathorax; legs elongate, with a thin clothing of erect pubescence. Abdomen smooth, shining, and sprinkled with erect black hairs; the surface of the peduncle in front subquadrate, narrowed at the base, the superior angles with long acute divergent spines, which have a minute spine at their base outside.

*Hab.* Borneo (Sarawak).

12. *POLYRHACHIS MODESTUS*. *P. niger*; thorace ovato, metathorace spinis duabus brevibus obtusis, squama spinis duabus acutis retrorsum curvatis armata.

*Female*. Length 3 lines. Black: head and thorax very delicately rugose; the flagellum rufo-piceous beneath towards the apex. Thorax ovate; the metathorax with two short blunt spines; wings hyaline, faintly yellow; the nervures pale testaceous; the apical joints of the tarsi obscurely ferruginous. Abdomen globose, smooth and shining; the scale quadrate, armed above at the lateral angles with two acute spines which curve backwards.

*Hab.* Singapore.

13. *POLYRHACHIS PANDARUS*. *P. opacus niger*; capite thoraceque subverrucatis, thorace antice posticeque abdominisque squama spinis duabus longis crassis acutis armatis.

*Worker*. Length 4 lines. Black: head and thorax coarsely shagreened; the palpi pale testaceous; head below the antennæ finely shagreened; the head with a sharp recurved margin posteriorly. Thorax: not flattened above; two long, stout, acute, divergent spines in front, and two similar ones posteriorly; the scale quadrate, with two long acute divergent spines, directed backwards; legs without spines or hairs; the calcaria, at the apex of the anterior tibiæ, pale testaceous, those on the intermediate and posterior pairs black. Abdomen smooth, opaque-black.

Examples of this species from Singapore have the abdomen rusty-red.

*Hab.* Borneo (Sarawak). Philippine Islands. Java.

14. *POLYRHACHIS HECTOR*. *P. opacus niger*; thorace spinis duabus longis acutis antice et postice armato; squama quadrata spinis duabus longis curvatis; abdomine obscure ferrugineo.

*Worker*. Length 4 lines. Opaque-black: delicately shagreened; the head narrowed posteriorly; the thorax armed with two long acute divergent spines in front, and two slightly divergent ones behind; the scale quadrate, with two long divergent spines above which curve backwards; the legs without spines or pubescence, the calcaria black. Abdomen with an obscure ferruginous tinge. Thorax not flattened above.

*Hab.* Singapore.

15. *POLYRHACHIS LÆVIGATUS*. *P. niger*, lævis, nitidus; metathorace

spinis duabus longis acutis retrorsum directis; abdominis squama spinis duabus curvatis armata; coxis femorumque basi rufis.

*Worker.* Length  $2\frac{1}{2}$  lines. Black, smooth and shining: the flagellum thickened towards the apex. Thorax: the anterior angles acute; the disk not flattened; the metathorax with two long, acute, divergent spines, directed backwards; the scale with a long curved spine on each side, directed to the curve of the abdomen; the coxæ and femora ferruginous, the anterior pair obscure. Abdomen globose, smooth and shining.

*Hab.* Malacca.

I have only seen a single specimen of this species: the clavate antennæ appear to indicate its belonging to a different genus.

16. *POLYRHACHIS CUSPIDATUS.* *P. niger*; prothorace metathoraceque medio elevatis et bispinosis; femoribus abdominisque basi ferrugineis.

*Worker.* Length  $2\frac{1}{2}$  lines. Black: head subovate, not narrowed behind; the base of the scape, the apex of the flagellum, and the tips of the mandibles, ferruginous. Thorax slightly compressed; the prothorax with an elevation in the middle which terminates above in two divergent spines; there is also a similar elevation, spined above on each side, on the metathorax; the coxæ, femora, and apical joints of the tarsi, ferruginous. Abdomen ferruginous at the base; the scale quadrate, deeply notched above.

*Hab.* Borneo (Sarawak).

17. *POLYRHACHIS FLAVICORNIS.* *P. niger*; capite thoraceque subopacis, abdomine nitido; flagello femorumque basi flavo-testaceis.

*Female.* Length 3 lines. Black: the head subopake, the flagellum and mandibles reddish-yellow; the basal joint of the flagellum, except its extreme apex, black; the scape rufo-piceous. Thorax subopake; ovate, without spines; legs rufo-piceous, the femora pale reddish-yellow; wings subhyaline, nervures pale testaceous, stigma brown. Abdomen fuscous; the scale quadrate, armed with two short, curved subacute spines.

*Worker.* Length 2 lines. Very like the female, but with the antennæ and legs of a deeper tint; the first joint of the flagellum black, except its apex; the thorax flattened at the sides, the superior surface slightly convex, divided by two transverse sutures, the margins acute. Abdomen globose, black and shining; the scale as in the female.

*Hab.* Singapore.

18. *POLYRHACHIS EQUINUS.* *P. niger nitidus*; thorace supra depplanato, metathorace et pedunculo bispinosis, pedibus pallide ferrugineis.

*Worker.* Length 3 lines. Black; head shining and delicately rugulose; the palpi pale rufo-testaceous. Thorax: flattened above, the margins acutely edged; the sides longitudinally delicately striated; the pro-

thorax, above, slightly concave, and shaped like a horse-shoe; the metathorax is also slightly concave, with the posterior angles acute and elevated; the metathorax smooth and shining behind; the legs rufo-testaceous. Abdomen: smooth, shining and subglobose; the scale elevated, with two short teeth above, the sides oblique; the scale narrowing to its base.

*Hab.* Sarawak.

19. *POLYRHACHIS DIVES*. *P. niger*, aureo-sericeo vestitus; thorace spinis acutis antice et postice armatis; squama quadrata spinis duabus longis curvatis.

*Worker*. Length  $2\frac{1}{2}$  lines. Black: clothed with pale golden pubescence; the thorax with two short curved spines in front, and two of about the same length at its posterior margin; the scale of the abdomen compressed, square in front, and having two long spines which curve backwards; the pubescence on the head and thorax with an obscure golden tinge; the legs without spines or pubescence; the calcaria pale testaceous.

*Hab.* Singapore.

20. *POLYRHACHIS VINDEX*. *P. niger*, subnitidus; thorace supra deplanato, spinis duabus anterioribus; squama integra; pedibus ferrugineis; tibiis et femoribus apice tarsisque fuscis.

*Worker*. Length  $2\frac{1}{2}$  lines. Black: the head and thorax with a shining hoary pile; the head longitudinally striated; the apex of the flagellum beneath, and the palpi, pale rufo-testaceous. Thorax flattened above, delicately striated longitudinally; the divisions of the thorax distinctly marked by two transverse sutures; the lateral margins raised and acute; the anterior angles produced into acute spines; the tibiæ and femora ferruginous, and more or less fuscous at their apex. The scale of the peduncle incrassate, compressed to a sharp edge above, which is rounded, and terminates in a minute tooth laterally. Abdomen smooth, shining and subglobose.

*Hab.* Borneo (Sarawak).

#### Subfam. PONERIDÆ.

#### Gen. ODONTOMACHUS, *Latr.*

1. *ODONTOMACHUS RIXOSUS*. *O. rufo-fuscus*, femoribus pallide testaceis; margine interna mandibulorum subserrata, thorace transversim striato.

*Worker*. Length  $4\frac{1}{2}$  lines. Reddish-brown: the coxæ, trochanters and femora pale testaceous, the extreme base, and apex of the latter, darker; the mandibles with two blunt teeth at their apex, the outer tooth notched on one side, forming a second tooth; the inner edge slightly serrated, having only four or five minute teeth; the prominence between the sulcations on the anterior part of the head,

obliquely striated; the striations crossing the sulcations, but terminating opposite the hinder margin of the eyes; the depression on the sides of the head striated, the striation becoming obsolete at the sides of the head. The thorax transversely striated, the metathorax most strongly so. The scale of the abdomen conical, terminating above in an acute spine; the abdomen very smooth and shining, the apex pale testaceous.

*Hab.* Singapore.

This species bears a strong resemblance to the type of the genus, *O. hæmatodes*, a South American insect; but that species has the head shorter, and the vertex delicately striated; the antennæ are shorter, the joints shorter: specimens which I consider to be identical with the present species, are in the collection at the British Museum, from Birmah and Singapore.

2. *ODONTOMACHUS RUGOSUS*. *O. rufescenti-fuscus*; capite supra longitudinaliter striato, lateribus lævibus nitidis, thorace pedunculoque rude rugosis.

*Worker.* Length 3 lines. Head of a red-brown, the mandibles and scape rather paler, the flagellum pale testaceous; the mandibles much narrowed at their base, their inner edge finely serrated, terminating in two long blunt teeth which are abruptly curved at right angles with the jaws; the head a little longer than broad, deeply emarginate behind, longitudinally striated above, the sides smooth and shining. Thorax darker than the head, and coarsely rugose; the legs ferruginous. The node of the abdomen conical and rugose; abdomen smooth and shining and of a dark rufo-piceous colour, the apex pale.

*Hab.* Singapore.

This is a very remarkable and distinct species, both in sculpture and form.

### Gen. *PONERA*, *Latr.*

1. *PONERA VERSICOLOR*. *P. purpureo et violaceo variegata seu obscure cerata*; capite, thorace abdominisque basi profunde striatis; nodo spinis duabus parvis armato.

*Worker.* Length  $4\frac{1}{2}$  lines. Black, with purple, violet and green tints in different lights: the head deeply striated longitudinally, the striæ terminating at the base of the clypeus, the anterior margin of which is subangular; the mandibles obscure ferruginous, their inner edge toothed, the teeth being alternately one large and one small; the mandibles finely striated; the eyes ovate, of moderate size, placed laterally about the middle. Thorax: in front with deep circular striæ, behind which are a few longitudinal ones on the disk; the sides and posterior portion obliquely striated, the apex transversely so; the calcaria and apical joints of the tarsi ferruginous. The node of the abdomen incrassate, rounded in front and above, and truncate behind,

with two short sharp spines on the verge of the truncation, pointing backwards; the first segment with transverse curved striæ.

*Hab.* Borneo (Sarawak). Philippine Islands.

Some specimens of this species are entirely of a bronze-green, and some have the legs more or less red.

2. *PONERA RUBRA*. *P. castaneo-rubra*, lævis et impunctata; abdomine elongato-ovato, nodo elevato antice rotundato, postice truncato.

*Female*. Length  $3\frac{1}{2}$  lines. Bright chestnut-red; the head smooth and impunctate; the head dusky before the ocelli; the mandibles serrated on their inner margin; the antennæ about the length of the thorax, slightly thickened towards their apex. Thorax: the disk slightly fuscous; narrowed towards the metathorax, which is obliquely truncate, the truncation smooth and shining; the anterior margin of the prothorax rounded. The peduncle of the abdomen, viewed sideways, is wedge-shaped, its front margin slightly rounded, behind truncate; the abdomen elongate-ovate, pointed, and slightly pubescent at the apex.

*Hab.* Singapore.

3. *PONERA APICALIS*. *P. nigra*; antennis mandibulis pedibus abdominisque apice ferrugineis.

*Female*. Length  $3\frac{1}{2}$  lines. Black: the antennæ, mandibles, legs and apex of the abdomen ferruginous; the head finely shagreened. Thorax oblong-ovate, finely longitudinally rugulose; the sides of the metathorax coarsely rugose, the truncation transversely striated; the scale of the abdomen incrassate, rounded above, transversely striated in front and behind; the abdomen smooth and shining, with a thin fine grey pubescence.

*Hab.* Borneo (Sarawak).

4. *PONERA IRIDESCENS*. *P. rufo-fusca*, lævis, nitida, chalybeo-iridescens; antennis pedibusque ferrugineis.

*Worker*. Length  $2\frac{1}{2}$  lines. Dark rufo-fuscous, with changeable tints of blue on the head and thorax, in different lights; the apex of the metathorax, the legs, antennæ, and apical margins of the segments of the abdomen, ferruginous; the head with an abbreviated impressed line above the insertion of the antennæ; the mandibles with their inner margin serrated and three teeth at their apex; the scale of the abdomen compressed, elevated, and rounded above. Abdomen oblong; the apical margin of the first segment slightly constricted.

*Hab.* Borneo (Sarawak).

5. *PONERA RUGOSA*. *P. ferruginea* rude rugosa; capite thoraceque profunde punctatis; abdomine rude sulcato et punctato.

*Female*. Length  $3\frac{1}{4}$  lines. Ferruginous; the head covered with coarse deep punctures, the punctures semi-confluent; the antennæ short and thick; the flagellum clavate and pubescent; the mandibles longitudinally

grooved. Thorax oblong, widest in front, the anterior margin curved, the lateral angles acute; the metathorax truncate; the prothorax with large deep confluent punctures; the mesothorax longitudinally grooved; the scutellum and metathorax ruggedly punctured. The abdomen longitudinally grooved, the grooves on the basal segment punctured; the node rugged and subglobose, beneath, furnished with a remarkable flattened semitransparent appendage.

*Hab.* Borneo (Sarawak).

6. *PONERA RUFIPES*, *Jerdon*. *P. atro-fusca*; capite thorace nodoque rugosis; abdomine longitudinaliter rude sulcato, pedibus abdominisque apice ferrugineis.

*Worker.* Length 5 lines. Obscure fuscous, scarcely black; the mandibles, the apex of the scape and of the flagellum, the legs and apex of the abdomen, obscurely ferruginous; the head, thorax, and node of the abdomen, rugose; the eyes small, placed forwards on the sides of the head; the antennæ short and thick, the flagellum clavate; two parallel longitudinal carinæ running backwards from the insertion of the antennæ to within about one-third of the posterior margin of the head. The thorax obliquely truncated behind, the truncation smooth and slightly shining; the truncation of the abdominal node smooth and shining, its margin denticulated; the abdomen coarsely grooved longitudinally.

*Hab.* Singapore. Malabar.

Specimens of this species from Borneo have the legs nearly or quite black.

7. *PONERA INTRICATA*. *P. nitida nigra*; capite, thorace abdominisque basi profunde et æqualiter striatis; nodo spinis duabus acutis armato; pedibus ferrugineis.

*Worker.* Length 5 lines. Black and shining; the mandibles, legs, and apex of the abdomen, ferruginous; the flagellum obscurely ferruginous; the head evenly and deeply grooved, longitudinally on the face, and transversely on the vertex; the antennæ as long as the insect. Thorax: the dilated portion with transverse grooves on the disk which are enclosed by curved ones; the thorax is much compressed, with a longitudinal groove above, the sides obliquely striated; the oblique truncation at the apex transversely striated. The node of the abdomen compressed, rounded above and in front, and obliquely grooved; the margin of the truncation with two acute spines above directed backwards; the basal segment of the abdomen with curved striæ, slightly impressed or obliterated at the sides; the apical margins of the segments rufo-piceous.

*Hab.* Borneo (Sarawak).

8. *PONERA GEOMETRICA*. *P. nigro-ænea*; capite, thorace abdominisque basi profunde striatis, nodo spinis duabus acutis armato.

*Worker.* Length 5 lines. Black, with more or less of a bronze tint; the head longitudinally striated; the clypeus angulated in front; the

mandibles ferruginous. Thorax: rounded anteriorly; the disk in front transversely striated, these striæ encircled by others which pass round the sides and front; the thorax beyond with a striation, which runs in an elongated oval direction, the sides obliquely striated; the legs very obscurely ferruginous. Abdomen: the node incrassate, rounded in front and above, truncated behind; the margin of the truncation deeply emarginate, the lateral angles of the emargination produced into long stout acute spines; the node with a curved striation, the curve being forwards; the first segment with a beautiful even curved striation; the apical segments smooth and shining, covered with a cinereous silky pubescence.

*Hab.* Singapore.

This species resembles the *P. versicolor*, but is much more regularly and evenly striated; the striation on *P. versicolor* is coarse and uneven, and directed differently on the thorax; the joints of the antennæ in this species are also longer and more slender. T. C. Jerdon has described a striated species of *Ponera*, but he says, "abdominal pedicle raised, pointing forwards with two small spines"—which does not agree with any of the insects here described.

9. *PONERA TRANSVERSA*. *P.* obscure rufo-fusca; thorace supra transverse rugoso; pedunculo margine supra emarginato.

*Worker.* Length 4 lines. Black: the head deeply striated, the striæ on the vertex diverging from the centre; the antennæ scarcely as long as the thorax, inserted at the side of two ridges at the base of the clypeus; the elevations, extreme base of the scape, and the mandibles, obscurely ferruginous. Thorax elongate, the sides straight, slightly narrowed from the front towards the abdomen; the margin of the thorax, in front, rounded, the lateral angles furnished with a short obtuse spine; the thorax is transversely striated its entire length; the verge of the oblique truncation at the apex with two very short obtuse spines; the legs ferruginous. Abdomen obscurely rufo-piceous, covered with a fine cinereous pile, and sprinkled with long pale hairs; the scale, when viewed sideways, is wedge-shaped, the upper edge deeply notched, and the scale transversely striated behind.

*Hab.* Singapore.

10. *PONERA VIDUA*. *P.* rufescenti-fusca; antennis elongatis; thorace ovato, postice truncato; alis hyalinis; abdominis nodo incrassato, subtus spinis duabus parvis armato.

*Male.* Length 4 lines. Red-brown: antennæ elongate, fusco-ferruginous, the base, and apex of the joints, pale testaceous; the eyes large and ovate, the ocelli large and of glassy brightness. Thorax ovate, with a thin loose downy pubescence; the metathorax truncate, the sides rugose; wings hyaline, the nervures pale yellow, with the



stigma brown; the legs pale testaceous. Abdomen smooth and shining, with thin scattered long pale pubescence, most dense towards the apex; a deep strangulation between the first and second segments; the node incrassate, coarsely rugose, rounded in front and above, truncate behind; beneath furnished with two short teeth.

*Hab.* Borneo (Sarawak).

11. *PONERA DIMINUTA*. *P. nigra*; vertice delicatule curvato-striato; pedibus rufo-piceis; abdomine lævigato nitido squama quadrata.

*Worker*. Length 3 lines. Black: the mandibles, and the extreme base of the scape, ferruginous; the flagellum fusco-ferruginous; the head elongate, narrowed behind, delicately striated; the striæ curved transversely on the vertex. Thorax elongate, produced into a neck anteriorly; swollen in front, compressed in the middle, and again widened to the apex, which is obliquely truncated; the truncation with a few deep transverse striæ; the thorax above with short irregular scratches or abbreviated striæ; the legs elongate, rufo-piceous, the tarsi pale. Abdomen: the scale, viewed laterally, is quadrate; above slightly narrowed in front, and truncated before and behind; the first segment rounded at the base and constricted at the apex, the second segment narrowed at the base; the abdomen smooth and shining, with the apical margins of the segments, and the apex, rufo-piceous.

*Hab.* Borneo (Sarawak).

This species is nearly an exact representative in form, on a reduced scale, of the *P. tarsata*.

12. *PONERA POMPILOIDES*. *P. nigra*, *Pompilum simulans*; thorace elongato-ovato; abdomine elongato nodo conico.

*Male*. Length 3 lines. Black: antennæ elongate, and finely pubescent. Thorax in front and behind obscurely ferruginous; the wings subhyaline, the nervures pale testaceous, the stigma brown; the apex of the coxæ, and the base of the femora, rufo-piceous; the apical joints of the tarsi pale ferruginous. Abdomen elongate, with a scattered pale downy pubescence; the apical margin of the first segment slightly constricted; the node conical and rufo-piceous.

*Hab.* Borneo (Sarawak).

13. *PONERA LÆVICEPS*. *P. nigra*; capite elongato lævi nitido; thorace abdomineque lævigatis nitidis; tarsis pallidis ferrugineis.

*Worker*. Length 3 lines. Black, smooth and shining: a few striæ on the face on each side of the clypeus; the latter triangular, with a central raised longitudinal carina; a longitudinal impressed line runs from the insertion of the antennæ half-way towards the posterior margin of the vertex. Thorax: in front forming a short neck, behind which it is swollen; from thence it is much narrowed and compressed; the apex oblique and transversely rugose; the tarsi pale

rufo-testaceous; the abdomen with a deep strangulation between the first and second segment; the node elevated and rounded above.

*Hab.* Borneo (Sarawak).

Gen. TYPHLOPONE, *Westw.*

1. TYPHLOPONE LÆVIGATA. *T. castanea nitida lævigata*, capite in medio sulcato.

*Worker.* Length 4 lines. Chestnut-red; smooth and shining, longitudinally channeled, slightly interrupted, in some examples, near the margin of the vertex; the inner margin, and apex of the mandibles, black. Thorax: a slightly impressed channel in front; the peduncle narrowed and rounded in front; the abdomen and legs rather paler than the head, the margins of the segments slightly constricted.

*Worker* (minor). About half the size, pale testaceous, and more abruptly truncated on the thorax.

*Hab.* Borneo (Sarawak).

Gen. TETRAPONERA, *Smith.*

1. Tetraponera atrata, *Smith, Ann. & Mag. Nat. Hist.* 2 ser. ix. p. 45 ♀.  
*Hab.* Sarawak.

Subfam. MYRMICIDÆ.

Gen. MYRMICA, *Latr.*

1. MYRMICA LONGIPES. *M. fusco-pallida, gracilescens*; capite in col- lum angustato; thorace compresso, metathorace bispinoso; pedibus elongatis; abdominis nodis duobus globosis.

*Worker.* Length  $2\frac{1}{2}$  lines. Dark brown: the legs testaceous, the tarsi and tips of the antennæ pale testaceous; antennæ longer than the body, very slender, the scape, and also the flagellum, slightly thickened towards their apex; head much wider than the thorax, narrowed behind the eyes, and prolonged into a short neck; the mandibles rufo-testaceous. Thorax: the prothorax elongate, narrowed anteriorly into a short neck, slightly swollen posteriorly; the division between the meso- and meta-thorax deeply impressed; the metathorax with two short acute upright spines. Abdomen ovate, pedunculate, the peduncle formed of two nodes, the first smaller and less elevated than the second, each having a short footstalk.

*Hab.* Singapore. Borneo.

Notwithstanding the remarkable form of this species, its long slender antennæ and legs, the prolongation of the prothorax into a neck, &c., all of which appear to warrant the formation of a new genus for its reception, yet, not being acquainted with either of the perfect sexes, I do not feel justified in removing it from the genus *Myrmica*.

2. *MYRMICA PELLUCIDA*. *M. fusco-testacea*; *antennis pedibusque pallide testaceis, abdomine pellucido*.

*Worker*. Length  $1\frac{1}{4}$  line. Head and thorax dark fusco-testaceous; antennæ and legs pale testaceous, nearly white; the divisions of the thorax distinctly marked, that between the meso- and meta-thorax rather deeply impressed; the abdomen of a transparent pale testaceous colour; the metathorax not spined.

*Hab.* Singapore.

Mr. Wallace, on a ticket attached to specimens of this insect, says, "House-ant: transparent abdomen: very active, but not destructive."

3. *MYRMICA VASTATOR*. *M. pallide flavo-testacea, lævis*; *abdomine nitido, apice fusciscenti*.

*Worker*. Length  $1\frac{1}{4}$  line. The head, thorax, antennæ, legs, and petiole of the abdomen, pale yellow-testaceous; the head oblong quadrate; the eyes small, placed forwards on the side of the head; antennæ clavate, the club formed of three joints; the thorax deeply strangulated between the meso- and meta-thorax; the latter without spines; the abdomen pale at its base, fuscous at its apex.

*Hab.* Singapore.

Mr. Wallace attaches a ticket to this species, "House-ant: very destructive."

4. *MYRMICA AGILIS*. *M. pallide ferruginea*; *abdomine nigro, basi pallido, lævissimo et politissimo*.

*Worker*. Length 1 line. Head, antennæ, thorax and legs pale rufo-testaceous; head and thorax very smooth and shining; the flagellum clavate, the club consisting of three joints, the basal joint of the flagellum as long as the three following. Thorax swollen anteriorly, the metathorax with two minute spines. Abdomen ovate, the first node of the peduncle elongate, the second subglobose.

*Hab.* Malacca.

#### GEN. HEPTACONDYLUS, *Smith*.

*Head* suborbiculate, wider than the thorax; *eyes* lateral and ovate; *stemmata* placed in a triangle on the vertex; *antennæ* geniculated, filiform, the scape nearly as long as the flagellum, placed forwards on the head at the base of the clypeus; the *flagellum* 6-jointed, the joints clavate, except the apical one, which is cylindrical; the *labial palpi* 3-jointed; the *maxillary palpi* 3-jointed. *Thorax* ovate, gibbous; the *scutellum* very prominent; the *metathorax* armed with two acute spines (in the females), compressed and strangulated (in the workers). The *superior wings* with one marginal and one complete submarginal cell, the submarginal cell receiving the recurrent nervure; the superior angle of the discoidal cell touching the costal nervure. *Abdomen* ovate; the *peduncle* consisting of two nodes.

This is perhaps the most remarkable genus hitherto characterized amongst the *Formicidæ*; it presents one of those anomalies which perplex the naturalist. In the aculeate division of the Hymenoptera, we have felt that there existed in every species certain undeviating and tangible characters, whereby the sex at least might always be discriminated; namely, an additional segment to the abdomen, whereby to distinguish the males, as well as an additional joint to the antennæ; the number of joints in the male being thirteen, and twelve in the female. It is true that one or two exceptions have been recorded: thus, the male of *Crabro vagus*, amongst the fossorial group, has only twelve perceptible joints to the antennæ; and amongst the *Apidæ*, the males of the genus *Cælioxys* have apparently only six segments in the abdomen; in the latter case, however, a seventh segment is concealed, or retracted, within the sixth segment; and in all probability, in the fossorial insect, a joint is concealed within the apex of the scape. In the present genus we find, however, so wide a departure from the normal condition, that it stands almost alone, as an exception to the general rule. In the 'Transactions of the Entomological Society,' vol. ii. of the 2nd series, I established a genus (*Orectognathus*) on characters exhibited in a neuter Ant, the insect having only five joints in the antennæ; but as a neuter cannot be fairly considered the perfect condition of a species, I have thought it possible that the discovery of the other sexes might prove that I had been premature in establishing a genus on the imperfect condition of the species. This cannot be urged in the present instance, as both the female and worker are described, and neither of them has more than six joints in the flagellum.

1. *HEPTACONDYLUS ARACHNOIDES*. *H. capite thoraceque lævissimis nitidis rufo-testaceis ferrugineo-subnebulosis; abdomine obscure rufo-piceo nitido; pedibus elongatis gracilibus pubescentibus.*

*Female*. Length  $4\frac{1}{2}$  lines. Head and thorax rufo-piceous, with dark ferruginous stains on the vertex, scutellum, and metathorax posteriorly; also two longitudinal lines of the same colour on the disk of the mesothorax; the abdomen very dark rufo-piceous, with the three apical segments pale rufo-testaceous; the entire insect very smooth and shining. The mandibles produced, with three black teeth at the apex, and one on the inner margin towards the apex; the antennæ pubescent; the thorax with scattered pale pubescence; the wings flavo-hyaline, the nervures pale testaceous; the legs elongate, with the apex of the joints and the tarsi pale rufo-testaceous; thickly covered with erect pale pubescence. Abdomen covered with pale

pubescence, the nodes of the abdomen dark rufo-piceous, globose, and each having a distinct petiole; the petioles pale rufo-testaceous.

*Worker.* Length  $2\frac{3}{4}$  lines. Dark rufo-fuscous: the antennæ, head beneath, mandibles and lower part of the face pale rufo-testaceous; antennæ slender and elongate; head smooth and shining, not carinated. Thorax shining, the lateral margins traversed by a sharp carina; the metathorax elevated and armed with two acute spines; the legs elongate and slender, the coxæ beneath, the base and apex of the femora and tibiæ, and the tarsi, pale ferruginous. Abdomen smooth and shining, the apex pale ferruginous.

*Hab.* Borneo (Sarawak).

2. *HEPTACONDYLUS SUBCARINATUS*. *H.* capite thoraceque ferrugineis; abdomine rufo-fusco; capite thoraceque carinulis irregularibus abbreviatis; metathorace spinis duabus acutis armato.

*Worker.* Length  $2\frac{1}{2}$  lines. Head, antennæ, thorax and legs, ferruginous, sometimes pale ferruginous; abdomen fuscous, or rufo-fuscous, the petiole of the basal node pale; head shining, and having a number of irregular delicate carinæ on the front and vertex; in front of the eyes are a number of irregular striæ. Thorax: the sides compressed, widest anteriorly; the superior surface slightly convex, and having a number of longitudinal abbreviated elevated carinæ; the lateral margins traversed by a slight carina; the metathorax with two stout acute spines. Abdomen smooth and shining; the insect sprinkled with a number of pale erect hairs, most numerous on the scape and legs.

*Hab.* Borneo (Sarawak).

3. *HEPTACONDYLUS CARINATUS*. *H.* obscure fusco-ferrugineus; capite thoraceque carinis irregularibus abbreviatis; metathorace spinis duabus longis armato.

*Worker.* Length  $2\frac{1}{2}$  lines. Dark fusco-ferruginous, closely resembling *H. subcarinatus*, but with thicker antennæ, and the joints shorter, the scape distinctly shorter and not so slender at the base; the head proportionably larger and much more strongly carinated; the thorax roughly carinated, and having longer and stouter spines; in other respects agreeing with *H. subcarinatus*.

*Hab.* Borneo (Sarawak).

This may possibly be a form of *H. subcarinatus*, but the various differences pointed out appear to characterize a distinct species.

The insect which I am about to describe, although evidently belonging to the *Poneridæ*, is of such a different and remarkable form, to any insect belonging to any of the sections of the genus *Ponera*, or any of the subgenera, that I propose to constitute a new genus for its reception; the abdomen of this singular species

is formed, as it were, of three nodes, each being a little longer and wider than the preceding.

### Gen. CERAPACHYS.

*Body* elongate; *head* narrowed before and behind the eyes; *eyes* ovate, lateral, placed about the middle of the head; *antennæ* short, incrassate; *mandibles* triangular, obsoletely toothed within. *Thorax* oblong-quadrate, strangled in the middle. *Abdomen*: oblong, with a deep strangulation between the first and second segments.

1. CERAPACHYS ANTENNATUS. *C. aterrimus*, nitidus; *antennis* brevibus, crassis; *thorace* oblongo-quadrate; *abdomine* elongato, nodo quadrate; *abdominis* segmentis primo et secundo incisura separatis.

*Worker*. Length  $3\frac{1}{2}$  lines. Jet-black, smooth and shining; *antennæ* one-third longer than the head; the scape short and incrassate, clavate; the flagellum incrassate, the joints short and transverse, except the apical one, which is as long as the four preceding joints; the head depressed on each side in front of the eyes; the antennæ inserted at the anterior margin of the head, each at the side of an elevated carina; the mandibles, flagellum and apex of the scape obscurely ferruginous; the posterior margin of the vertex slightly emarginate its entire width, a few scattered minute punctures on the vertex, and a small fossulet in the middle between the eyes. *Thorax*: oblong-quadrate, with a few scattered punctures above, and a few short erect hairs; the tips of the femora and tarsi, and the apical joints of the latter, pale rufo-testaceous; the basal joint of the anterior tarsi bent; the calcaria white. *Abdomen* elongate; the peduncle quadrate, a little narrower than the first segment of the abdomen, which has the sides slightly rounded; a deep strangulation between the first and second segments; the apex obliquely truncated, the margins of the truncation finely denticulated.

*Hab.* Borneo (Sarawak).

2. CERAPACHYS OCULATUS. *C. pallide fuscus*; *oculis* magnis, atris; *antennis* pedibusque pallide testaceis; *alis* hyalinis; *petiolo* bi-articulato, binodi.

*Male*. Length  $2\frac{1}{2}$  lines. Pale-brown, with dark stains on the sides of the thorax; head oblong-quadrate, the mandibles forming a triangular projection; the eyes large and prominent, situated anteriorly on the sides of the head; the ocelli large, placed in a dark stain on the vertex; the mandibles, antennæ, and legs, pale testaceous. The thorax oblong-ovate; the wings hyaline and iridescent, the nervures pale testaceous; the basal node of the petiole narrow at the base, widened to the middle, and again narrowed to the apex, the widest part with a sharp edge, or carina; the second node ovate;

the abdomen subovate, widest towards the extremity, the apex pointed.

It is quite possible that this may prove to be the male of *C. antennatus*, but I do not feel authorized in placing them together.

### Gen. CREMATOGASTER, *Lund*.

1. CREMATOGASTER ANTHRACINUS. *C. aterrimus*, lævis et nitidus; tarsi rufo-piceis.

*Worker*. Length  $1\frac{1}{4}$  line. Jet-black, smooth and shining; the face with a few delicate striæ; the extreme base of the scape, and the apex of the flagellum, pale testaceous. Thorax: flattened above, opaque and finely rugose; the metathorax armed on each side with an acute spine; the tarsi pale testaceous, with the claw-joint darker. Abdomen: heart-shaped, smooth, shining and impunctate.

*Hab*. Singapore.

2. CREMATOGASTER BRUNNEUS. *C. pallide castaneo-rufus*, lævis nitidusque; thorace spinis duabus acutis armato.

*Worker*. Length 2 lines. Reddish-brown, or castaneous, varying a little in colour; head smooth and shining, wider than the thorax, about the same width as the abdomen, slightly emarginate at the vertex, and more deeply coloured. Thorax: the disk concave and finely striated longitudinally; the metathorax deeply concave and furnished on each side with a stout acute spine; the legs, with the tips of the joints and the tarsi, pale testaceous. Abdomen: heart-shaped, smooth and shining; the first node heart-shaped, flattened above; the second node globose, with two tubercles above.

*Worker minor*. About one-third smaller, and of a pale testaceous colour; the abdomen darker at the apex.

*Hab*. Borneo (Sarawak).

3. CREMATOGASTER CEPHALOTES. *C. testaceus*; capite thorace duplo latiore; spinis metathoracis brevibus et acutis.

*Worker*. Length  $1-1\frac{1}{4}$  line. Testaceous; head very large, smooth and shining; the antennæ, clypeus and mandibles, pale testaceous. Thorax: rounded anteriorly, deeply constricted in the middle; in front rugose, with a smooth shining space before the constriction; the metathorax deeply excavated, produced laterally into an acute spine on each side; the tibiæ and tarsi pale testaceous. Abdomen heart-shaped; the basal node flattened anteriorly, with the sides angulated; the second node globose.

*Worker minor*. Differs in having the head proportionably smaller, and the thorax smooth and shining above.

*Hab*. Borneo (Sarawak).

4. *CREMATOGASTER OBSCURUS*. *C. testaceus*, lævis et nitidus; thorace strangulato; metathorace bispinoso.

*Worker*. Length  $1\frac{1}{4}$  line. Dull testaceous; the base of the scape and of the flagellum, the clypeus and mandibles, pale; the head smooth and shining. Thorax: rounded in front, with a central longitudinal channel; deeply strangulated in the middle; the metathorax somewhat quadrate, with the posterior lateral angles produced into short spines; the legs with the apex of the joints, and the tarsi, pale testaceous. Abdomen heart-shaped; the basal node of the peduncle flattened in front, the narrow end above.

*Hab.* Borneo (Sarawak).

5. *CREMATOGASTER INFLATUS*. *C. niger*, lævis et nitidus; parte postica thoracis pallide testacea, inflata.

*Worker*. Length  $2\frac{1}{2}$  lines. Black, smooth and shining; the antennæ dark rufo-piceous; the mandibles striated and ferruginous, their teeth black; eyes small and lateral, placed about the middle of the head. Thorax: the anterior margin rounded; the posterior portion inflated into a yellowish semi-transparent bladder-like swelling, divided in the middle by a deep longitudinal depression; the swollen part not quite so wide as the head; the apical joints of the tarsi rufo-testaceous. Abdomen heart-shaped; the peduncle, base, and the apical margin of the first segment, obscurely rufo-piceous.

*Hab.* Singapore; Borneo (Sarawak).

This is one of those singular and anomalous species, which, without any particle of information, derived from observation, puzzle and perplex the naturalist; what can possibly be the use of the bladder-like excrescence on the thorax of this insect, it is difficult to imagine; to the touch it is elastic, and apparently forms a receptacle for saccharine fluids. With the aid of a microscope, a small circular orifice can be seen at each of the posterior lateral angles of the swollen part, and small crystallized particles are apparent, not only within the orifice, but scattered over the surface of the inflation; we may, therefore, reasonably suppose that this singular apparatus is for the purpose of elaborating a suitable and necessary aliment for the larvæ of this singular insect.

6. *CREMATOGASTER DIFFORMIS*. *C. niger*; capite thorace multum latiore; thorace dilatato et postice profunde excavato; abdomine cordato.

*Worker*. Length  $2\frac{1}{4}$  lines. Black; head very large, twice as wide as the thorax; the tips of the mandibles, and apical joints of the flagellum, dark ferruginous; the head smooth and shining; the eyes small, placed laterally about the middle of the head. Thorax: the anterior margin rounded, the sides parallel behind; the metathorax greatly dilated at the sides and above, and with a deep excavation behind;



the legs stout, with their joints and the tarsi ferruginous. Abdomen heart-shaped, with the base, in some examples, slightly ferruginous.

*Worker minor.* Differs only in being one-third smaller.

*Hab.* Singapore; Borneo (Sarawak).

This species resembles the *C. inflatus* in form; but the swollen portion of the thorax is of a solid consistency; it forms, however, a similar laboratory of saccharine matter; the orifice from which it exudes is not exactly at the posterior angles, but a little way beneath; in some specimens, masses of crystallized particles can be seen beneath the orifice; of this species, both large and small workers have been examined, and the same apparatus is found on them both.

### Gen. ATTA, Latr.

1. ATTA PENETRANS. *A.* capite thoraceque nigris; abdomine obscure rufo-piceo; alis subhyalinis; capite thoraceque longitudinaliter striatis.

*Female.* Length 4 lines. Black and shining; head longitudinally finely striated; the mouth, clypeus and antennæ, ferruginous. Thorax: elongate-ovate, the prothorax anteriorly and the legs, ferruginous; the thorax above with oblong punctures which run into striæ; an impunctate line in the middle of the mesothorax anteriorly; the metathorax truncated, the truncation smooth and shining; wings subhyaline, with a fuscous line along the costal nervure; the apical margins of the wing with a fringe of very fine white hairs. Abdomen: elongate-ovate, dark rufo-piceous, the apical margins of the segments brighter; the nodes of the peduncle globose and punctured.

*Hab.* Borneo (Sarawak).

2. ATTA CINGULATA. *A.* ferruginea; pedibus abdomineque pallide ferrugineis; capite maximo, thorace triplo latiore.

*Worker major.* Length  $1\frac{3}{4}$  line. Head very large, ferruginous, the antennæ paler; eyes very small, placed at the sides of the head a little before the middle. Thorax: pale ferruginous, very convex or globose anteriorly, much narrower behind, with two short acute spines on the metathorax; legs pale rufo-testaceous. Abdomen: ovate, with the base truncated, with a fuscous ring in the middle; the nodes of the peduncle globose.

*Worker minor.* About 1 line in length. The head much smaller and more elongate; in colour, resembling the larger worker, and equally smooth and shining; the abdomen with a fuscous ring in the middle.

*Hab.* Borneo (Sarawak).

### Gen. PHYSATTA.

*Head* small; *eyes* of moderate size, placed a little before the middle; *ocelli* in a triangle on the vertex; *mandibles* stout and denticulate

at the apex; *antennæ* short, not so long as the head and thorax; the *scape* nearly as long as the flagellum, slightly thickened at the apex; *flagellum* subclavate, 6-jointed, the first joint shorter than the second; the third, fourth and fifth about the same length as the first, the apical joint the length of the two basal ones. *Maxillary palpi* 3-jointed, the basal and apical joints of about equal length, the intermediate joint twice the length of the apical joint, the latter obliquely truncate at the apex. *Labial palpi* 3-jointed, the two basal joints clavate, the apical one fusiform. *Thorax* subglobose; *anterior wings* with one marginal and two submarginal cells, the first submarginal cell about the length of the stigma, the second extending to the apex of the wing; with one sub-triangular discoidal cell; the *tibiæ* armed with a single spur at the apex. *Abdomen* globose, pedunculated, the peduncle formed of two nodes.

This genus in one of its most prominent characters agrees with the genus *Heptacondylus*, both having seven-jointed antennæ: their relative proportions are, however, very different, as well as that of the joints of the flagellum; the wings have also a different neururation; this latter character will, I am inclined to believe, prove eventually that by which the generic divisions of the Hymenoptera must be regulated; even at present, with our meagre and imperfect knowledge of the species, it does, if strictly adhered to, bring together assemblages of species, allied alike in habit and structure; when taken in connexion with the structure of the mandibles and legs, indicative of habit, it becomes perhaps the most safe and available character hitherto adopted for their generic subdivision; the greatest help to science I think is its simplification.

1. *PHYSATTA DROMEDARIUS*. *P.* capite thoraceque ferrugineis; alis abdomineque nigris.

*Female*. Length  $6\frac{1}{2}$  lines. The head, thorax, legs and petiole of the abdomen ferruginous; the mandibles with four or five black teeth; the head and thorax longitudinally striated and clothed, as well as the legs, with erect thin fulvous pubescence; the intermediate and posterior legs dark rufo-piceous; wings dark fuscous, slightly iridescent; the metathorax armed with two short stout spines at its base, the truncated portion transversely striated. Abdomen black, covered with a short erect fuscous pubescence; the nodes of the petiole subglobose, the first attached to the thorax by a short stout petiole.

*Hab.* Borneo (Sarawak).

## Gen. TYPHLATTA.

*Mandibles* triangular; *eyes* obsolete; *flagellum* 9-jointed; petiole of the abdomen formed of 2 nodes.

The above characters are those of the worker of the species; probably an examination of the other sexes would present other very distinctive generic characters, particularly in the neururation of the wings: the palpi I have not examined.

1. TYPHLATTA LÆVICEPS. *T. niger*, nitidus; capite, thorace antice et abdomine glaberrimis; antennis tarsisque rufo-piceis.

*Worker.* Length 2 lines. Black; the head glassy-smooth and shining; ovate, with the posterior margin of the vertex truncate; in some examples, an indistinct castaneous spot at the sides of the head, in the usual situation of the eyes; the antennæ ferruginous. Thorax elongate, compressed at the sides; very smooth and shining anteriorly, with a delicate striation in the middle, the metathorax being finely rugulose; the tarsi rufo-piceous. Abdomen: ovate, very smooth and shining; the nodes subglobose, the basal one being the smallest.

*Hab.* Borneo (Sarawak).

## Subfam. CRYPTOCERIDÆ.

## Gen. ECHINOPLA.

*Head* transverse; *eyes* small, placed laterally, high on the head; antennæ 12-jointed, inserted forwards on the head, wide apart; the *labial palpi* 4-jointed, the three basal ones of about equal length, clavate; the apical joint as long as the two preceding joints united; the *maxillary palpi* 5-jointed, elongate, the three apical joints long and slender, the two basal ones much shorter and stouter; *mandibles* short, stout, and of equal width throughout, armed with five stout teeth. *Thorax* oblong-quadrate; legs of moderate length; tarsi 5-jointed; each tibia armed with a single spine at the apex. *Abdomen* globose; peduncle formed of a single node; the first segment very large, concealing the other segments beneath it.

1. ECHINOPLA MELANARCTOS. *E. nigra*, hispida; oculis extantibus; abdominis squama in utroque latere spina longa acuta horizontali; abdomine globoso.

*Worker.* Length 3 lines. Black; the head, thorax and abdomen, covered with short blunt spines, or pedestals, each having a long hair at its summit; the palpi pale testaceous; the antennæ inserted under thin elevated curved plates on the anterior part of the face, the face with a rugose striation; the head smooth beneath, shining and concave; the eyes very prominent and globose. Thorax rugose; the legs slightly pubescent, the calcaria pale testaceous. (Fig. and details, Plate I.)

*Hab.* Singapore.

2. *ECHINOPLA PALLIPES*. *E. nigra*, hispida; oculis prominentibus; abdomine globoso; squama in utroque latere spina horizontali; pedibus pallide testaceis.

*Worker*. Length  $2\frac{1}{2}$  lines. Black, rugose; the abdomen vermiculate, interspersed with slight elevations placed in great regularity over the entire upper surface, each elevation terminating in a hair; the scape and the mandibles ferruginous; the eyes very prominent; the palpi and legs pale testaceous, with the tarsi rufo-piceous; the peduncle transverse, produced on each side into a short horizontal spine; the abdomen rufo-piceous.

*Hab.* Borneo (Sarawak).

It is very difficult to describe the sculpturing of this insect; on the head it is strongest; the species strongly resembles *E. melanarctos*, but the elevations are shorter, as well as the hairs at their apex.

3. *ECHINOPLA STRIATA*. *E. nigra*; capite, thorace et abdomine longitudinaliter striatis; thorace oblongo, subquadrato; pedunculo transverso.

*Worker*. Length 3 lines. Black; the head, thorax and abdomen finely striated longitudinally; the head with an obscure blue tinge; the palpi pale rufo-testaceous. Thorax: oblong, the margins denticulate, the anterior margin rounded, the lateral margins narrowed to the middle, and again widened posteriorly; above slightly arched; the division of the pro- and meso-thorax distinctly marked by a suture; that of the meso- and meta-thorax by a deep strangulation; the peduncle of the abdomen incrassate, transverse, and armed on each side by a stout spine. The entire insect thinly sprinkled with erect black hairs.

*Hab.* Malacca.

Of this species I have only seen two individuals: I place it in this genus with some hesitation; but the antennæ are similar; the thorax and scale of the abdomen of the same form; the legs also are short, as in *Echinopla*: the principal difference being, that the eyes are less prominent; it is altogether a very curious and remarkable species.

#### Gen. CATAULACUS, *Smith*.

1. *CATAULACUS INSULARIS*. *C. niger*; vertice spinis duabus postice armato; alis flavo-hyalinis; metathorace bispinoso; abdomine cordato.

*Male*. Length 3 lines. Black: head and thorax rugose; the antennæ, the eyes, the mandibles, the tibiæ and the tarsi, ferruginous; the palpi pale; the eyes very large and prominent; the clypeus produced and broadly truncate in front; the hinder margin of the vertex straight, margined, and having the posterior lateral angles produced into stout acute spines; the outer margins of the spines serrated; beneath are smaller spines at the lower lateral angles; the wings sub-

hyaline and yellowish; the nervures scarcely discernible; the hinder margin of the metathorax slightly emarginate its entire width, with an acute spine at each of the lateral angles. The nodes of the abdomen rugose; the first node oblong-quadrate; the second nearly quadrate; the abdomen reddish at the base, and, as well as the nodes, thinly sprinkled with erect whitish hairs.

*Hab.* Borneo (Sarawak).

2. *CATAULACUS HORRIDUS*. *C. niger*; capitis angulis posticis spinosis; marginibus capitis crenulatis; thorace aspere sculpto, spinis duabus acutis elongatis postice armato; abdomine ovato, basi striato.

*Worker.* Length 3 lines. Black; the antennæ short, thick and clavate; the apex rufo-testaceous; head reticulated, produced before the eyes and widely truncated, the lateral angles of the truncation rounded; the lateral margins with a short spine before the eyes; the vertex with the posterior margin emarginate its entire width, forming at the lateral angles large acute spines. Thorax: ruggedly sculptured on the disk, narrowed to the apex of the mesothorax, which is separated from the hinder portion by a deep transverse incision; produced posteriorly at the angles into long, stout, acute spines; the nodes of the abdomen rugose; abdomen rounded, emarginate and striated at the base; the entire insect sprinkled with short erect white setæ.

*Hab.* Borneo (Sarawak). Malacca.

3. *CATAULACUS RETICULATUS*. *C. niger*, delicatule reticulatus, præsertim in abdomine; marginibus capitis thoracisque lateribus crenulatis; thorace spinis duabus validis postice armato.

*Worker.* Length  $1\frac{1}{4}$ –2 lines. Black; head and thorax reticulated; antennæ short, thick and clavate; the clypeus widely emarginate; the sides of the head produced into a sharp angle in front of the eyes; behind the eyes the margin is crenulated, the posterior lateral angles acute. Thorax: the anterior margin slightly rounded; the sides rounded and narrow to the metathorax, with a short tooth anteriorly and posteriorly; the thorax produced behind into two elongate, lateral, acute spines; the anterior tibiæ and tarsi and the apical joints of the intermediate and posterior tarsi, ferruginous. Abdomen: oval, margined, emarginate in front and very delicately reticulate.

*Var. a. minor.* The scape, apical joint of the flagellum, the margin of the head before the eyes and the legs, ferruginous.

*Hab.* Borneo (Sarawak).

This species somewhat resembles the *C. Taprobanae*, but is different in sculpture and form.

#### Gen. MERANOPLUS, *Smith*.

1. *MERANOPLUS CASTANEUS*. *M. castaneo-rufus*; capite thoraceque subrugosis; metathorace bispinoso; pedunculi nodo secundo spina postice armato.

*Female.* Length  $3\frac{1}{4}$  lines. Chestnut-red; the flagellum obscurely red; the teeth of the mandibles and the eyes black; the head and thorax above longitudinally strigose, the head more finely so, both sparingly covered with scattered erect fine pale hairs; the scutellum rugose; the metathorax with a stout acute short spine on each side at its base; the central portion of the truncation shining and finely striated longitudinally; the legs with scattered pale hairs, the femora dark red towards their base. The nodes of the peduncle of the abdomen rugose; the first, viewed laterally, wedge-shaped; the second subquadrate, the posterior margin produced into an acute spine; the second node is produced into an angular tooth or process at its base, and both are sprinkled with long erect hairs. Abdomen ovate, finely punctured, and thinly sprinkled with long pale hairs, most thickly covered towards the apex.

*Hab.* Borneo (Sarawak).

2. *MERANOPLUS CORDATUS.* *M. castaneo-rufus*; thorace quadrispinoso; abdomine cordato.

*Worker.* Length 2 lines. Chestnut-red; the head and thorax palest; the head very delicately reticulated; the eyes small and black, placed at the sides of the head backwards near the vertex; the clypeus widely truncate in front. Thorax: punctured, the anterior margin somewhat transverse, slightly produced and rounded in the middle, the lateral angles acute; the sides rounded and narrowed to the base of the metathorax; the posterior margin transverse; at the angles are long acute spines, with a second shorter spine before them; the truncated vertical portion of the metathorax has on each side about the middle of the lateral margins a short acute spine. Abdomen: the first node, viewed laterally, is wedge-shaped, the second somewhat quadrate, its posterior margin above produced into an acute spine; the upper margin of the first node, truncate; the abdomen heart-shaped, acute at the apex; the entire insect sprinkled with erect pale hairs.

*Hab.* Borneo (Sarawak).

This is probably the worker of *M. castaneus*.

3. *MERANOPLUS MUCRONATUS.* *M. capite*, thorace pedibusque ferrugineis; abdomine nigro; thorace quadrato; angulis singulis spina acuta armatis.

*Worker.* Length  $2\frac{1}{2}$  lines. The head and thorax ferruginous; the abdomen black; the head coarsely rugose, narrowed before the eyes and widely emarginate in front; the eyes prominent, behind them the margins are widened slightly to half the distance between them and the posterior angles of the head, towards which the margins are narrowed; the head sprinkled with a few long erect reddish hairs. Thorax: quadrate, rugose, with the angles produced into four very long, stout, acute spines; the hinder margin with two short blunt teeth or spines in the middle, with two minute ones beyond them placed some-

what obliquely; the metathorax with two long, rather slender, very acute spines; the thorax and legs thinly sprinkled with very long ferruginous hairs; the abdomen sprinkled with long erect ferruginous hairs, the nodes rugose.

Var. *a*. The femora rufo-fuscous.

*Hab.* Malacca (Mount Ophir).

To this species Mr. Wallace attached a ticket, upon which he had written "House Ant:," but I have not obtained any further information.

## Fam. MUTILLIDÆ.

### Gen. MUTILLA, *Linn.*

1. *Mutilla blanda*, *Smith, Cat. Hym.* pt. iii. p. 32.

*Hab.* Malacca (Mount Ophir). India.

2. *Mutilla repræsentans*, *Smith, Cat. Hym.* iii. p. 35.

*Hab.* Borneo (Sarawak). Malacca. India.

3. *MUTILLA DEIDAMIA*. *M. nigra*; scapo, mandibulis, thorace, pedibus abdominisque segmento basali rubris.

*Female.* Length 3-4 lines. Head black; the scape, palpi and mandibles, ferruginous, tips of the latter black; the flagellum ferruginous towards the apex beneath. Thorax: elongate-quadrate, slightly widened behind, above rugose, the lateral margins crenulated; sprinkled with reddish-brown pubescence; the legs ferruginous, thinly sprinkled with a mixture of reddish and of glittering white hairs. Abdomen: black, the basal segment red; three ovate spots of silvery white pubescence placed transversely towards the base of the second segment, and a broad fascia of the same at the base of the third segment; at the base, apex and beneath, a scattered glittering white pubescence.

*Hab.* Borneo (Sarawak).

4. *MUTILLA URANIA*. *M. capite thoraceque sanguineis*; abdomine nigro, basi segmenti secundi macula ovata, fasciaque segmenti tertii, flavescenti-albis.

*Female.* Length  $6\frac{1}{2}$  lines. Head and thorax blood-red and coarsely rugose; the mandibles and antennæ black; the flagellum obscurely red beneath. Thorax: the legs black and covered with glittering yellowish-white pubescence. Abdomen: longitudinally rugose, a reversed heart-shaped spot at the base of the second segment, and the third covered with yellowish-white pubescence; a triangular black spot at the base of the third segment in the middle; beneath, the segments are fringed with long pale hairs; the apical margins of the segments of the abdomen with a sooty-black pubescence.

*Male.* Length 5-5½ lines. This sex has the head nearly, or quite black;

the eyes slightly reniform. Thorax red; the wings dark brown with a purple iridescence, pale towards their base. Abdomen black, smooth and shining, much narrowed at the base, and subpetiolate; the second and two following segments fringed with long white pubescence; the three apical segments fringed with black.

*Hab.* Borneo (Sarawak).

5. *MUTILLA SUSPICIOSA*. *M. nigra*, pubescens; alis fuscis; abdominis segmentis secundo tertioque rubris.

*Male.* Length 4-7 lines. Black; the eyes slightly emarginate; the head covered with a thin silvery-white pubescence, most sparing on the vertex, which is shining and coarsely punctured. Thorax covered with a silvery pubescence, densely so on the metathorax; the disk of the mesothorax shining, with elongate punctures which run into striæ; in the middle are three elongate carinæ; the tegulæ large and shining-black; the wings dark fuscous, with a purple iridescence. Abdomen finely punctured; the apical margin of the basal segment, and the second and third segments, red; sprinkled with long glittering silvery-white hairs.

*Hab.* Borneo (Sarawak).

This species very closely resembles the *M. fuscopennis*: but I think it is sufficiently distinct.

6. *MUTILLA GRACILLIMA*. *M. capite abdomineque nigris*; thorace rubro; alis obscure fuscis.

*Male.* Length 4 lines. Head and abdomen black, the thorax bright red; head shining, with longitudinal furrows, and a deep channel before the anterior stemma; the scape, and first joint of the flagellum, ferruginous; the pro- and meso-thorax rugose; the metathorax with large separated punctures; the wings fuscous, subhyaline at their base; the anterior tibiæ and femora, and the intermediate femora, ferruginous; the calcaria white. Abdomen: the two basal segments with purple and blue tints; the apical margin of the second segment, and the third segment, with a broad band of silvery-white pubescence; the following segments fringed with black pubescence.

*Hab.* Borneo (Sarawak).

7. *MUTILLA FAMILIARIS*. *M. capite abdomineque nigris*; thorace rubro; abdominis basi subito truncato; abdominis segmenti secundi basi macula, tertii fascia lata argenteo-pubescentibus.

*Female.* Length  $4\frac{3}{4}$  lines. Head and abdomen black, the former rugose; the flagellum ferruginous beneath. Thorax ferruginous and oblong-quadrate; the disk rugose; the margins crenulated. Abdomen with elongate confluent punctures; the basal segment abruptly truncated; the second segment with a small ovate spot in the middle of its base, and the third segment covered with short silvery-white pubescence;



beneath, the margins of the segments are fringed with long white pubescence.

*Hab.* Singapore.

Although this species bears a very close resemblance to several which have been described, it is very distinct, and may be readily distinguished by the abrupt truncation of the basal abdominal segment.

8. *MUTILLA CALLIOPE*. *M. capite nigro; thorace rubro; abdomine cyaneo, fascia lata argenteo-pubescenti decorato.*

*Female.* Length 3-3½ lines. Head black, punctured, the punctures running into longitudinal striæ; the base of the scape, and the tips of the mandibles, ferruginous. Thorax bright ferruginous, elongate-quadrate and coarsely rugose; the posterior angles rounded; the anterior tibiæ and tarsi, and the base of the intermediate and posterior femora, ferruginous; the legs with a scattered silvery pubescence, that on the thorax above, ferruginous; the thorax slightly carinated at the sides. Abdomen dark blue; the apical margin of the second segment, and the base of the third, with united fasciæ of bright silvery pubescence; the sides and apex of the abdomen with scattered silvery hairs.

*Male.* Resembles the female in colour, but has the legs entirely black; with the apical margin of the second abdominal segment, pale testaceous; the wings dark brown; the eyes large and ovate.

*Hab.* Borneo (Sarawak).

9. *MUTILLA PROSERPINA*. *M. capite abdomineque nigris; thorace pedibusque rubris; abdominis segmenti secundi basi maculis duabus ovatis, tertii fasciæque argenteo-pubescentibus.*

*Female.* Length 2-3 lines. Head black; the scape, mandibles and palpi, ferruginous. Thorax ferruginous, oblong, rounded in front and behind; rather finely rugose, sprinkled with reddish-brown pubescence, the margins crenulated; the legs ferruginous, with the knees and tarsi slightly fuscous. Abdomen: the extreme base ferruginous; the second segment with two ovate spots, and the third with a fascia of silvery-white pubescence; beneath, and towards the apex above, thinly sprinkled with long glittering white hairs.

*Hab.* Borneo (Sarawak).

10. *MUTILLA PANDORA*. *M. capite abdomineque nigris; thorace rubro; abdominis segmento secundo maculis tribus ovatis, tertio fascia argenteo-pubescenti ornatis.*

*Female.* Length 5 lines. Head black; the scape, flagellum beneath, except the basal segment, the palpi, and basal half of the mandibles, ferruginous; the head coarsely and closely punctured, with scattered erect black hairs above, and with silvery white ones beneath. Thorax and legs bright ferruginous, the former oblong-quadrate, coarsely rugose, the lateral margins crenulated; sprinkled with reddish

pubescence. Abdomen black, the base ferruginous; covered with short black pubescence; three ovate spots at the base of the second segment, a narrow fascia on its apical margin, and a broad one on that of the following segment, of silvery-white pubescence; beneath, shining and punctured, the margins of the segments rufo-piceous and fringed with glittering pale hairs.

*Hab.* Borneo (Sarawak).

11. *MUTILLA SIBYLLA*. *M. capite abdomineque nigris; thorace rubro; abdominis segmenti secundi basi maculis duabus ovatis, fasciaque segmenti tertii albo-pubescentibus.*

*Female.* Length 4-6 lines. Black; the thorax red; a tubercle at the insertion of each antenna, and the middle of the mandibles, ferruginous; the vertex with scattered long erect reddish brown hairs; on the clypeus, mouth and cheeks are some long glittering silvery-white hairs; the palpi elongate. Thorax: oblong-quadrate, the anterior margin slightly rounded; the legs with scattered glittering white hairs; the legs black, with the tarsi obscurely rufo-piceous; the calcaria pale testaceous. Abdomen: two small ovate spots at the base of the second segment, and a broad fascia on the apical margin of the third, of dense, short, silvery-white pubescence; beneath, the segments shining, and the second with scattered large deep punctures; the apex of the abdomen with long white pubescence.

*Hab.* Borneo (Sarawak).

12. *MUTILLA CASSIOPE*. *M. capite abdomineque nigris; thorace pedibusque rubris; tibiis tarsisque fuscis; abdominis basi truncata.*

*Female.* Length 3 lines. Head and abdomen black, the former closely and strongly punctured; the mandibles, palpi and antennæ beneath, ferruginous; the scape rufo-piceous. Thorax ferruginous; the anterior margin transverse; slightly and evenly narrowed to the apex of the metathorax; the lateral margins crenulated; the disc coarsely rugose; the coxæ and femora ferruginous; the tibiæ and tarsi fuscous. Abdomen: the base abruptly truncate; covered with elongate punctures; the apical margin of the third segment with a fascia of snow-white pubescence; sprinkled over with long silvery-white hairs.

*Hab.* Borneo (Sarawak).

13. *MUTILLA DARDANUS*. *M. capite abdomineque nigris; thorace pedeque antico rubris; alis fuscis; abdominis segmentis primo, secundo tertioque pube alba fasciatis.*

*Male.* Length 6 lines. Head and abdomen black; the thorax red; the eyes emarginate; the antennæ incrassate at the base, tapering to the apex; a deep longitudinal furrow runs from the insertion of the antennæ to the posterior margin of the vertex, on each side of which is a similar furrow which terminates before the insertion of the antennæ; the ocelli distinct on the vertex. Thorax: the anterior legs

ferruginous; wings brown, and iridescent. Abdomen shining, punctured, and having purple and blue tints in different lights; a narrow fascia on the apical margin of the first segment and a broader one on the second and third, of snow-white short dense pubescence; the margins of the apical segments fringed with long black pubescence.

*Hab.* Borneo (Sarawak).

14. *MUTILLA UNIMACULATA*. *M.* capite abdomineque nigris; thorace ferrugineo; abdominis segmenti secundi basi macula ovata, segmento tertio fascia lata alba pubescente.

*Female.* Length 6 lines. Black; the thorax ferruginous, and coarsely rugose. Head sprinkled with dark brown hairs, eyes large and ovate; the clypeus and scape with whitish hairs. Thorax oblong-quadrate, slightly narrowed posteriorly; the disk with short reddish-brown pubescence at the sides; beneath and on the legs it is of a glittering silvery-white; the metathorax with long thin pale pubescence; an ovate spot at the base of the second segment, and the third segment clothed with dense short white pubescence, in the middle at its base, a triangular black shape; beneath, the apical margins of the second, third and fourth segments with white marginal pubescent fasciæ.

*Hab.* Borneo (Sarawak).

#### Gen. MYRMOSIDA, *Smith*.

*Head* subquadrate; *stemmata* in a triangle on the vertex; *eyes* large, round and lateral; *antennæ* subfiliform, inserted at the base of the clypeus, not closely approximating; the *clypeus* triangular; *mandibles* triangular. *Thorax*: longitudinally quadrangular, the sides slightly rounded; the posterior margin of the prothorax curving backwards to the origin of the wings; the tegulæ small; the superior wings with one marginal and two submarginal cells; the first submarginal receiving the first recurrent nervure. *Abdomen*: ovate, the two basal segments forming distinct nodes, the first subquadrate, the second node widening towards the apex and again narrowing at one fourth from the apex.

The insect from which the above characters are drawn being a male, there can be little doubt that when the other sex is discovered the generic characters will require a complete revision; in the neururation of the wings this genus very closely approaches that of *Mutilla*, the males of which have the third submarginal cell frequently obliterated, and the form of the abdomen often very eccentric; the form of the eyes also varies, from being deeply emarginate or reniform, to being round and very prominent. The situation of the present genus I think must be next to *Myrmosa*:

we should certainly expect to find the female apterous, and the genus correctly placed in the family *Mutillidæ*.

1. *MYRMOSIDA PARADOXA*. *M. nigra*; capite thoraceque rude rugosis; alis subhyalinis; abdomine basi binodoso.

*Male*. Length 4 lines. Black; head nearly as wide as the thorax, coarsely rugose, across the face between the eyes are some deep transverse grooves; the face with two longitudinal carinæ, outside of which the antennæ are inserted; the scape short and thick, the flagellum nearly of equal thickness throughout, pointed at the apex, the extreme tip pale testaceous; mandibles ferruginous at their apex; the palpi pale testaceous. Thorax: coarsely rugose; wings subhyaline, the nervures ferruginous, stigma dark brown; the anterior tarsi ferruginous, with a dense glittering pale pubescence beneath; the base of the femora, knees and apex of the tibiæ and apical joints of the tarsi, ferruginous; the calcaria pale rufo-testaceous. The abdominal nodes coarsely longitudinally rugose; the abdomen smooth and shining, the second and following segments punctured, with their apical margins impunctate.

*Hab.* Singapore.

Only one specimen of this very singular insect has been captured, and is in the collection of W. W. Saunders, Esq.

### Tribe FOSSORES, *Latr.*

#### Fam. SCOLIADÆ.

#### Gen. SCOLIA, *Fabr.*

Div. 1. *The anterior wings with two submarginal cells and one recurrent nervure.*

1. *Scolia erratica*, *Smith, Cat. Hym.* pt. 3. p. 88.

*Scolia verticalis*, *Burm. Abh. Nat. Ges. Halle*, p. 37.

*Hab.* Sarawak.

Div. 2. *The anterior wings with two submarginal cells and two recurrent nervures.*

2. *Scolia aureicollis*, *St. Farg. Hym.* iii. 499.

*Hab.* Singapore.

3. *Scolia grossa*, *Burm. Abh. Nat. Ges. Halle*, i. p. 23.

*Hab.* Sarawak.

This is *Tiphia grossa* of the 'Systema Piezatorum' of Fabricius.

4. *Scolia Iris*, *St. Farg. Hym.* iii. p. 547.

*Hab.* Malacca (Mount Ophir). Java. Sumatra. China (Shanghai).

Div. 3. *The anterior wings with three submarginal cells and one recurrent nervure.*

5. *Scolia patricialis*, *Burm. Abh. Nat. Ges. Halle*, i. 19.

*Hab.* Malacca. Sumatra.

6. *Scolia rubiginosa*, *Fabr. Syst. Piez.* p. 241.

*Hab.* Malacca. Java.

7. *SCOLIA CINCTA*, *Smith.* *S. nigra*; vertex flavo; alis nigris; abdomine fascia pubescente ferruginea.

Black; the head, from the insertion of the antennæ to the hinder margin of the vertex, yellow, glossy smooth. The thorax closely and strongly punctured; a smooth shining space in the middle of the disk, the scutellum also shining, with a few large scattered punctures; the wings brown-black with a splendid violet iridescence, rather paler towards their base with the nervures ferruginous; the metathorax truncated and slightly concave. Abdomen: closely but more finely punctured than the thorax, with a shining nearly impunctate space in the middle of each segment; the posterior margin of the second segment with a fringe of bright ferruginous pubescence, also a little ferruginous pubescence at the tip of the apical segment.

*Female.* *Hab.* Borneo (Sarawak). Length 13 lines.

This species is most closely allied to *S. patricialis*, but has the sculpture of the thorax very different and has no yellow markings on the scutellum, base and third segment of the abdomen, which distinguishes that species.

8. *Scolia procera*, *Fabr. Syst. Piez.* p. 241.

*Hab.* Sarawak. Java.

Nearly all the specimens of this fine species have been brought from Java. I believe it has occurred in India, but Borneo is probably the extent of its geographical range to the south.

9. *SCOLIA OPALINA*, *Smith.* *S. atra*; alis nigris; metathorace abdomineque opalino pulcherrime lavatis.

Black, with splendid prismatic colours reflected in certain lights; the head smooth and shining, and with a few scattered punctures; the scape of the antennæ smooth and shining, the flagellum opaque. Thorax: above shining, somewhat distantly but evenly punctured, a smooth space on the disk of the mesothorax; wings brown-black with a splendid violet iridescence. The abdomen smooth and shining, the sides and the two apical segments rather closely punctured, in the middle of the three basal segments only a few fine scattered punctures; beneath strongly but not very closely punctured. *Female.* Length 12 lines.

The male resembles the female, but is, if possible, more beautiful in the splendour of its metallic lustre. Length 9 lines.

*Hab.* Sarawak.

10. *SCOLIA SPECIOSA*. *S. atra*; fronte, macula post-oculari, thoracis maculis duabus frontilibus, metathorace supra, fascia annuli tertii abdominis interrupta, flavis.

Black and shining; the head impunctate; a large bell-shaped macula on the face extending from the margin of the vertex to the insertion of the antennæ, a black spot nearly in the centre of the space enclosing the ocelli; the eyes and a lunate spot behind them yellow. Thorax: a broad yellow stripe on each side in front curving over each tegula, having a straight oblique termination within; the metathorax yellow at the base as far as the margin of the truncation; the whole of the disk of the thorax impunctate, or with only a few widely scattered punctures on the sides of the mesothorax and scutellum: from the anterior angles of the latter a deeply impressed smooth line passes forward, terminating opposite to the anterior margin of the tegulæ; the post-scutellum punctured and the thorax on each side of the scutellum opaque; the wings brown-black, with a splendid violet and blue iridescence, the nervures black. Abdomen: closely punctured, the first segment with a central smooth space at its base; the second segment smooth and shining, except at the sides; the third smooth at the base with a broad transverse yellow stripe slightly interrupted in the middle; beneath, the segments smooth and shining in the middle, and with a few scattered punctures.

*Female*. Length 15 lines. *Hab.* Sarawak.

This is one of the most beautiful species of the genus, and has not hitherto been captured in any other locality than Borneo.

#### Gen. *TIPHIA*, *Fabr.*

1. *TIPHIA FUMIPENNIS*. *T. nitida, atra, punctata*; alis anticis fumatis purpureo-iridescentibus.

*Female*. Length 8 lines. Black, shining, pubescent, with scattered punctures; the mandibles ferruginous, fringed beneath with bright fulvous hairs; the head strongly punctured. The prothorax strongly punctured, its posterior margin impunctate, smooth and shining; the mesothorax strongly punctured; the tegulæ smooth and shining; the superior surface of the metathorax with three central longitudinal elevated lines, the spaces between them rugose; the verge of the truncation and the lateral margins bordered by an elevated line; the surface has a shining silky appearance and is very delicately transversely reticulated; the anterior wings smoky, with a bright purple iridescence; the posterior pair faintly coloured towards their apex; the legs with a glittering white pubescence. Abdomen: smooth and shining; the three apical segments punctured; the apex rufopiceous.

*Hab.* Borneo (Sarawak).

2. *TIPHIA STIGMA*. *T. nitida*, atra, punctata; alis subhyalinis, stigmatate atro.

*Male*. Length 5 lines. Black, punctured and shining; the clypeus with shining white pubescence; its anterior margin notched; tips of the mandibles ferruginous; the flagellum fuscous beneath; the metathorax with three or four longitudinal elevated lines; wings subhyaline, faintly smoky towards their apex; the nervures pale testaceous; the stigma large and black; the tibiæ and tarsi with glittering white pubescence; the calcaria pale testaceous. Abdomen: the first segment much narrower than the second, and subglobose; the following segments thinly covered with sooty-black pubescence.

*Hab.* Borneo (Sarawak).

3. *TIPHIA FLAVIPENNIS*. *T. nitida*, atra, sparse griseo-pubescent; alis flavescentibus.

*Female*. Length 4-5 lines. Black, with scattered punctures: the mandibles ferruginous; the palpi pale testaceous; the flagellum obscurely ferruginous beneath; the scape fringed beneath with long glittering pale hairs; the superior surface of the metathorax, with three longitudinal elevated lines, extending to the verge of the truncation; the outer margin of the tegulæ piceous; wings yellowish, their apical margins slightly clouded; stigma small, and as well as the nervures, pale testaceous; the legs with a glittering white pubescence; the calcaria pale testaceous. Abdomen: smooth and shining, with scattered delicate punctures; the margins of the segments thinly fringed with long pale hairs; the apex rufo-piceous.

*Hab.* Borneo (Sarawak).

#### Gen. MYZINE, Latr.

1. *MYZINE TRICOLOR*. *M. punctata*, nitida; capite rubro; thorace nigro; abdomine metallico-cyaneo.

*Female*. Length 10 lines. Head red; the thorax black; the abdomen metallic-blue; the face closely and coarsely punctured; the vertex shining, the punctures finer and more distant; a deep punctured fovea behind the ocelli; the scape in front, and the mandibles ferruginous, the latter black at their tips. Thorax coarsely punctured; the wings brown at their apex, becoming by degrees hyaline at their base, the anterior pair with a bright violet iridescence; the nervures black; the legs strongly spinose, with scattered white pubescence. The abdomen partaking of purple and violet tints in different lights.

*Hab.* Borneo (Sarawak).

#### Fam. POMPILIDÆ.

##### Gen. POMPILUS, Fabr.

This extensive genus of insects, some species of which inhabit

every known country of the world, contains individuals exhibiting great variety, not only in their colouring, but also in their structure and form; one group, which contains the most highly coloured and elegantly formed species, have their tibiæ and tarsi destitute, or nearly so, of spines; another, on the contrary, have their tibiæ more or less spined, the anterior tarsi spined, and frequently pectinated; a third group have the intermediate and posterior tibiæ furnished with a double row of teeth, or serrations, the tarsi being strongly spined. All the above striking differences are, however, linked together by imperceptible modifications; these will always be found, when an extensive collection of these insects, from various countries, are brought together and carefully examined. The differences alluded to are undoubtedly of high value, when investigating the œconomy and habit of the species; thus we find, that the *P. punctum* of Europe, which belongs to the subgenus *Agenia*, in which the species are destitute of spines on the tibiæ, is not a burrowing insect, but constructs tubular cells of mud; *P. rufipes*, on the contrary, is eminently fossorial and has serrated posterior tibiæ, and has also the anterior tarsi furnished with long cilia. In the present paper, I adopt as subgenera, the names given to the groups by Schiödte, in Kröyer's Tidsskrift.

1. *POMPILUS LEUCOPHÆUS*. *P. schistaceo-pubescentis*; facie albo-maculata; prothoracis margine postica alba; alis fuscis basi hyalinis.

*Male*. Length  $5\frac{1}{2}$  lines. Black, covered with slate-coloured pubescence or pile; a spot on each side of the clypeus, the inner orbits of the eyes, not reaching their vertex, a narrower line behind them and the palpi, yellowish-white; the antennæ stout and tapering to their apex; the hinder margin of the prothorax white and subangulated; wings brown, becoming gradually hyaline to their base; the tibiæ and tarsi strongly spinose; a white spot on the posterior tibiæ near their base; the calcaria nearly as long as the basal joint of the tarsi. Abdomen densely pilose; the apical margins of the three basal segments naked and shining; the four apical segments beneath, naked and shining.

*Hab.* Malacca.

2. *POMPILUS VAGABUNDUS*. *P. ater*, guttis maculisque flavis variegatus; alis hyalinis apice fuscis; tibiis posticis ferrugineis.

*Female*. Length  $5\frac{1}{2}$  lines. Black; a line on the inner orbits of the eyes; the anterior margin of the clypeus with a narrow line which unites with a quadrate spot on each side of the clypeus, and a narrow line behind the eyes, yellow; the face with a thin silvery pile, and the cheeks with a few white hairs. Thorax covered with a fine silky white



pile, which is more dense on the coxæ and femora beneath; the posterior margin of the prothorax, and a minute spot on the outer margin of the tegulæ, yellow; the wings hyaline, with a dark fuscous cloud at the apex of the anterior pair: the second submarginal cell twice the width of the third, which is subangular; the nervures fuscous; the calcaria and posterior tibiæ ferruginous, the latter black at their extreme base and apex; the tibiæ and tarsi spinose; the anterior tarsi ciliated. Abdomen covered thinly with a fine changeable pile; a transverse yellow fascia near the base of the second and third segments, the first slightly interrupted in the middle, both widest at the sides; a narrow transverse yellow fascia in the middle of the fifth segment, slightly produced upwards in the middle.

*Hab.* Borneo (Sarawak).

This species has a strong resemblance to the *P. variegatus* of Europe, but from which it is abundantly distinct.

3. *POMPILUS PULVEROSUS.* *P. ater*, pubeque cinerea tectus; alis hyalinis apice nigro-fuscis.

*Male.* Length 4 lines. Black; entirely covered with a fine glittering white silky pile; the face silvery; head and thorax smooth, shining and impunctate; the hinder margin of the prothorax subangular; the wings hyaline and iridescent, with a slight fuscous cloud beyond the first submarginal cell; the nervures dark fuscous; the legs spinose, with their calcaria nearly as long as the basal joint of the tarsi. Abdomen with a faint tinge of blue in certain lights.

*Hab.* Borneo (Sarawak).

#### Subgen. *PRIOCNEMIS*, *Schiödte*.

4. *PRIOCNEMIS SERICOSOMA.*

*Pompilus sericosoma*, *Smith, Cat. Hym.* p. 146. no. 137.

*Hab.* Sumatra. Borneo (Sarawak).

5. *PRIOCNEMIS OPTIMUS.* *P. atra*, capite, thorace, dorso metathoracisque lateribus et maculis basi, coxis intermediis, aureo-pubescentibus; alis nigro-fuscis; femoribus posticis ferrugineis, basi apiceque nigris.

*Female.* Length 8 lines. Black; the head and scape above covered with golden pubescence; the clypeus convex, somewhat produced in the middle of its anterior margin, which is slightly emarginate and recurved; the apex of the mandibles ferruginous. Thorax: the prothorax, mesothorax, scutellum, and sides of the metathorax posteriorly, covered with golden pubescence; a golden spot at the sides of the pectus, close to the base of the intermediate coxæ; the wings dark fuscous with a beautiful violet iridescence; the posterior margin of the inferior pair subhyaline; legs elongate, the middle of the posterior femora ferruginous; the intermediate and posterior tibiæ with a

double row of serrations. Abdomen subpetiolate and covered with a fine silky pile.

*Hab.* Singapore.

6. *PRIOCNEMIS VERTICALIS*. *P. ater*; vertice antennarumque articulis basalibus flavis; thorace flavo-guttato; alis, tibiis tarsisque flavis.

*Female*. Length 9-12 lines. Black; the vertex and face above the antennæ and also the scape, yellow; the first and second joints of the flagellum more or less yellow. Thorax: a line on the posterior margin of the prothorax, a quadrate spot on the disk of the mesothorax touching the scutellum, the latter as well as an ovate spot on the post-scutellum, the outer margins of the tegulæ, the tips of the femora, the tibiæ and tarsi, yellow: the claw-joint of the latter black; the wings yellow with their nervures ferruginous; the wings palest towards their apical margins, their extreme edge indistinctly fuscous; the metathorax transversely striated; the posterior tibiæ with two rows of serrations, the intermediate pairs spinose. Abdomen smooth and shining.

*Hab.* Malacca (Mount Ophir); Borneo (Sarawak).

This species bears a close resemblance to *P. unifasciata*, Smith, 'Cat. Hym.' iii. p. 145, but independent of a difference in the neururation of the anterior wings, the armature of the legs is totally different: in *P. unifasciata* the posterior tibiæ are armed with long scattered spines, not serrated, as in the present species.

#### Subgen. *AGENIA*, *Schiodte*.

7. *AGENIA BLANDA*.

*Pompilus blandus*, *Guér. Voy. Coq. Zool.* ii. pt. 2. p. 260.

*Hab.* Borneo (Sarawak); Singapore; Malacca (Mount Ophir).

8. *AGENIA ATALANTA*. *A. atra*; capite thoraceque flavo notatis; alis flavis fusco terminatis; tibiis tarsisque flavis.

*Male*. Length 7-7½ lines. Black; covered with fine silky pile. The clypeus, sides of the face, scape in front, a line behind the eyes, the mandibles and palpi, yellow. The posterior margin of the prothorax, the outer margins of the tegulæ, a quadrate spot on the disk of the mesothorax touching the scutellum, and an ovate spot on the scutellum and post-scutellum yellow; the scutellum prominent; the tibiæ, tips of the femora and the tarsi yellow; the apex of the posterior tibiæ and the claws of the tarsi dusky; the metathorax transversely rugose-striate; the wings yellow, the nervures ferruginous; the tips of the anterior and posterior wings dark brown, with a purple iridescence. Abdomen, with a slight metallic lustre.

*Hab.* Borneo (Sarawak); Singapore.

9. *AGENIA ÆGINA*. *A. capite abdomineque nigris; thorace sanguineo; alis anticis fascia transversa fusca.*

*Female.* Length 5 lines. Head and abdomen black, the thorax red. The antennæ beneath and the mandibles ferruginous; the palpi elongate, pale testaceous. Thorax: the wings hyaline and iridescent, with a transverse broad dark fascia before the apex of the anterior wings; the nervures pale ferruginous, with a fuscous stain traversing the apical portion of the externo-medial nervure and the basal portion of the transverso-medial nervure; the anterior legs pale ferruginous; the tarsi, the tibiæ and apex of the femora above, fuscous; the intermediate legs fusco-ferruginous, with a yellow spot on the femora beneath towards their base; the posterior legs fusco-ferruginous; the femora yellow, with their apex fuscous. Abdomen smooth and shining, covered with a fine silky pile.

*Hab.* Borneo (Sarawak).

10. *AGENIA DAPHNE.* *A. atra*; capite thoraceque maculis auratis ornatis; alis subhyalinis, ad apicem subnubeculosis.

*Female.* Length 8 lines. Black; the face, vertex and clypeus covered with golden pile; the palpi pale testaceous. The prothorax, the apical margin of the disk of the mesothorax, the scutellum, an oblique stripe beneath the wings extending to the intermediate coxæ, the sides of the metathorax and the coxæ, covered with golden pile; the legs with a fine silky pile; the wings subhyaline, with a slight fuscous cloud before the apex of the anterior pair. Abdomen smooth and shining, covered with a fine changeable glittering silky pile.

*Hab.* Borneo (Sarawak).

11. *AGENIA LAVERNA.* *A. obscure cyanea*, fascia albida; alis hyalinis; abdomine petiolato, annulo apicali albido.

*Male.* Length 4 lines. Obscure blue, covered with a fine gray silky pile. The face, clypeus, labrum, palpi and scape in front, white; the labrum exserted; the antennæ as long as the body, testaceous beneath. The anterior femora in front, a narrow line in front of the intermediate pair, not extending to their apex, and a minute spot in front on the tegulæ, white; the wings hyaline and beautifully iridescent, the nervures black; the metathorax with a fine transverse granulation. Abdomen petiolated; the apical segment white.

*Hab.* Borneo (Sarawak).

This species in many respects approaches closely to the species of the genus *Ceropales*: its exserted labrum, white face, and indistinctly observable joints of the antennæ, are all characteristics of that genus, but the cubital nervure does not run to the apical margin of the wing.

12. *AGENIA MELAMPUS.* *A. atra*; faciei lateribus, margine clypei antica mandibulisque flavis; alis fuscis basi hyalinis; annulis tribus basalibus abdominis ferrugineis.

*Male.* Length  $5\frac{1}{2}$  lines. Black; the sides of the face, the anterior margin of the clypeus, the mandibles and scape in front, yellow, tips

of the mandibles ferruginous; the palpi black. Thorax: the anterior coxæ in front and a minute spot in front of the intermediate pair, yellow; the apex of the femora beneath and the anterior tibiæ in front, ferruginous; the posterior femora slightly ferruginous above; the wings brown with their base hyaline, the posterior pair palest. Abdomen petiolated, with the three basal segments ferruginous; the apical margin of the third segment dusky, covered with a fine white silky pile.

*Hab.* Borneo (Sarawak).

13. *AGENIA FLAVOPICTA*. *A. atra* flavo variegata; pedibus flavis; alis hyalinis iridescentibus.

*Female*. Length  $3\frac{1}{4}$  lines. Head black; a broad stripe at the inner orbits of the eyes, the clypeus, labrum, mandibles, palpi and scape in front, yellow; the flagellum reddish-yellow, fuscous above beyond the first joint. Thorax: the prothorax, tegulæ, scutellum, post-scutellum, the apex of the metathorax and the legs, yellow; the apical joints of the tarsi fuscous; the metathorax with a changeable golden pile; the wings hyaline and beautifully iridescent, the nervures testaceous. Abdomen: the second, third and fourth segments black with a changeable pile, the apical margins testaceous yellow; the basal and fifth and sixth segments, yellow; the apical segments incurved; the sting elongate.

*Hab.* Singapore.

14. *AGENIA HIPPOLYTE*. *A. atra*, facie metathoracisque lateribus aureo-pubescentibus; alis flavo-hyalinis; femoribus posticis ferrugineis, basi apiceque nigris.

*Female*. Length  $6\frac{1}{2}$  lines. Black, with a fine changeable pile; the face, clypeus and cheeks covered with a dense pale golden pile. The sides of the metathorax and the posterior coxæ above with a dense pale golden pile; the wings flavo-hyaline, the nervures testaceous; the posterior femora ferruginous, their base and apex black. Abdomen: distinctly petiolated, the apical margins of the segments narrowly rufo-testaceous; the sixth segment with a central longitudinal smooth shining space.

15. *AGENIA CELÆNO*. *A. atra*, cinereo-pubescentibus; facie abdomineque argenteo-iridescentibus; alis hyalinis apice fuscis.

*Female*. Length  $3\frac{1}{2}$  lines. Black; covered with a changeable cinereous pile, that on the face, coxæ and abdomen having in certain lights a silvery brilliancy; the tips of the mandibles and the palpi pale testaceous; the posterior margin of the prothorax curved; the wings hyaline, with a faint fuscous fascia crossing the superior pair at the second submarginal cell, the apex of the wings narrowly and slightly fuscous; the apical segment of the abdomen nigro-piceous with the extreme apex pale, very glossy, smooth and shining.

*Hab.* Singapore.

Gen. *MACROMERIS*, *St. Farg.*

*Macromeris*, *St. Farg. Hym.* iii. 4631.

1. *MACROMERIS SPLENDIDA*.

*Macromeris splendida*, *St. Farg. Hym.* iii. 464. 2.

*Hab.* Borneo (Sarawak). India. Java. China. Malacca.

2. *MACROMERIS ARGENTIFRONS*. *M. ater*, pube argentata tecta; facie dense pubescente; alis subhyalinis; metathorace quadrato.

*Female*. Length 8 lines. Black; covered with a fine silvery silky pile, very dense and brilliant on the face, base and apex of the metathorax, sides of the prothorax and coxæ; the wings subhyaline, the nervures dark ferruginous; the joints of the anterior tarsi remarkably attenuated at the base; the claws of the tarsi small and unidentate; the tibiæ slightly spinose; the thorax subelongate, the sides parallel; the metathorax transversely rugose. Abdomen distinctly petiolated, very smooth and shining, abruptly incurved; the aculeus elongate.

*Male*. About the same size as the female, similarly clothed with silvery pile; the coxæ greatly swollen; the femora much stouter than in the female, and ferruginous beneath; the anterior tibiæ ferruginous within; the posterior tibiæ bent inwardly at their base; the thorax gradually widening to the apex of the metathorax, which is finely roughened transversely and margined at the truncation. Abdomen small, distinctly petiolated, and very smooth and shining.

*Hab.* Borneo (Sarawak). Malacca. Singapore. Java.

Gen. *MYGNIMIA*, *Smith.*

This genus of *Pompilidæ* contains all those species which have the first recurrent nervure uniting with the second transversocubital nervure, the posterior tibiæ strongly serrated, with a double row of short spines. These insects are in fact the representatives of the *Pepsis* of South America, and embrace some of the largest and most beautiful species of *Pompilidæ*; all, with one solitary exception, (a species from Mexico), are inhabitants of the Old World; *Pepsis*, on the contrary, is almost exclusively found in the New World: I am only acquainted with four exceptions, three being African, and one from Singapore.

1. *MYGNIMIA FLAVA*.

*Pompilus flavus*, *Fabr. Syst. Piez.* p. 197.

*Hemipepsis flavus*, *Dahlb. Hym. Europ.* p. 123.

*Hab.* Borneo (Sarawak). Malacca (Mount Ophir). Singapore. India.

2. *MYGNIMIA ANTHRACINA*.

*Mygnimia anthracina*, *Smith, Cat. Hym.* pt. iii. 183.

*Hab.* Borneo (Sarawak). Malacca and Singapore.

3. *MYGNIMIA DUCALIS*. *M. atra*; alis nigris, anticis fascia argentata ornatis.

Black; the abdomen blue-black with a fine silky pile; the third and following joints of the flagellum fuscous, the tips of the joints ferruginous; the clypeus, the scutellum and post-scutellum, obscurely fusco-ferruginous; the metathorax transversely striated, and truncate at the apex; the margin of the truncation raised; the wings brown-black with bright violet and purple shades; a broad silvery band crosses the anterior wings beyond their middle, the band consisting of fine silvery pile. *Female*. Length 1 inch  $\frac{3}{4}$ .

*Hab.* Malacca (Mount Ophir).

4. *MYGNIMIA PRINCEPS*. *M. atra*; antennis flavis, alis nigris, anticis fascia subhyalina ornatis.

*Female*. Length 1 inch 10 lines. Black; with obscure shades of blue, the abdomen blue-black, covered with a fine pile which partakes of purple or blue shades in different lights. The scape of the antennæ ferruginous in front, the flagellum yellow; a ferruginous line bordering the anterior margin of the clypeus. Thorax: the hinder margin of the scutellum obscurely ferruginous; the metathorax coarsely transversely striated; the posterior tibiæ and basal joint of the tarsi with a fine changeable ferruginous pile within; the wings brown-black, with a broad sub-hyaline transverse fascia beyond the middle, the fascia tinged with yellow.

*Hab.* Borneo (Sarawak).

5. *MYGNIMIA IRIDIPENNIS*.

*Female*. Length 1 inch. Black; the clypeus densely covered with a short dense black pubescence, slightly emarginate in front; the mandibles obscurely ferruginous in the middle. Thorax: the wings with a splendid lustre of coppery and violet tints, beneath, equally vivid in colour; the metathorax coarsely striated transversely; the pro- and meso-thorax with a short black velvety pubescence. Abdomen sub-opaque, with shades of blue in certain lights.

*Hab.* Malacca. Sarawak.

## Fam. SPHEGIDÆ.

### Gen. AMPULEX, *Jurine*.

1. *AMPULEX HOSPES*, *Smith, Cat. Hym.* pt. iv. p. 272.

The particulars in which this remarkable species differs from those with which I have associated it, would perhaps warrant the establishment of a new genus, but only a few specimens have yet been obtained; and although in all, the first transverse cubital nervure is obsolete, still it is a circumstance of frequent occurrence in the genus, particularly in the typical species *A. compressa*. The antennæ are much stouter and shorter, and the posterior angles of the thorax without spines, in all which particulars it differs from the rest of the genus.

2. *AMPULEX COMPRESSA*.

*Chlorion compressum*, *Fabr. Syst. Piez.* p. 219.

*Hab.* Malacca (Mount Ophir). Borneo (Sarawak).

3. *AMPULEX SMARAGDINA*. *A. læte viridis*; pedibus abdomineque purpureis; prothorace tuberculato; alis anticis obscure unifasciatis.

*Female.* Length 8 lines. Brilliant green with shades of violet and coppery effulgence; the vertex angulated, the sides oblique from the margin of the eyes; the antennæ shorter and much thicker than in *A. insularis*. The prothorax subtuberculate in front; the mesothorax, scutellum and post-scutellum, smooth and shining, the former with a longitudinal coppery vitta in middle; the wings subhyaline; the anterior pair with a slight fuscous cloud crossing them from the marginal cell; the legs bright purple; the anterior pair with their coxæ beneath, their femora and tibiæ in front ferruginous. Abdomen brilliant purple, smooth, shining and impunctate.

*Hab.* Singapore.

4. *AMPULEX INSULARIS*. *A. fulgide viridis*, abdomine purpureo lavato; prothorace elongato, lævigato, nitido, sine tuberculis; alis anticis fasciatis.

*Female.* Length 8 lines. Brilliant green; the head smooth and shining; the vertex subquadrate with the posterior angles rounded; the clypeus covered with silvery pubescence; the mandibles ferruginous; the antennæ black. The prothorax smooth and shining, not tuberculate; the mesothorax, scutellum and post-scutellum, smooth and shining; the metathorax transversely striated, and having a central and three lateral carinæ, the third recurved inwards at the apex; the sides margined, the apical angles produced into short acute teeth; the wings subhyaline with a fuscous cloud crossing the anterior pair at, and being the width of, the marginal cell; the tibiæ and tarsi obscurely æneous. Abdomen: very smooth and shining, with purple and violet tints; the apex compressed at the sides; the first segment much narrower than the second.

*Hab.* Borneo (Sarawak).

Gen. *TRIROGMA*, *Westw.*1. *TRIROGMA CÆRULEA*.

*Trirogma cærulea*, *Westw. Trans. Ent. Soc. Lond.* iii. 225 ♂. *Arcana, Ent.* ii. p. 66 ♀.

*Hab.* Singapore. Northern India and Madras.

2. *TRIROGMA PRISMATICA*. *T. fulgide cæruleo-viridis*; abdomine purpureo et violaceo lavato.

*Male.* Length 6 lines. Brilliant green, the abdomen vivid purple or violet in different lights, highly prismatic; the palpi and mandibles white, the latter ferruginous at their apex; the scape of the antennæ green with purple reflexions, the flagellum fuscous; the face below

the antennæ, the scape, cheeks and mandibles, thinly covered with long white pubescence; the head coarsely punctured; a deep transverse impressed line behind the ocelli, the vertex impunctate. Thorax: the prothorax forming a neck, with two elevated tubercles behind; the mesothorax with three or four transverse elevated carinæ at the base, the spaces between rugose; the disk behind, smooth and shining; the scutellum with an elevated shining tubercle in the middle; the metathorax smooth and shining, with an elevated carina traversing its margins; the lateral margins produced at the sides into a blunt angle or tooth; the disk with two longitudinal carinæ which curve towards the sides, then inwardly towards the apical margin, not quite meeting in the centre; between the curved carinæ are two central and two lateral ones, none extending to the outward ones; wings subhyaline and splendidly iridescent; the thorax at the sides and beneath, and also the abdomen, thinly clothed with white pubescence; the third segment above, with scattered short white hairs. Abdomen very delicately and distantly punctured.

*Hab.* Borneo (Sarawak).

This beautiful species is very distinct from the *Trirogma cærulea*, the only species previously known; the antennæ are much longer and perfectly filiform, the apex of the joints not thickened as in that species.

### Gen. SPHEX, *Fabr.*

#### 1. SPHEX SERICEA.

*Sphex sericea*, *Fabr. Syst. Piez.* p. 211, 19.

*Hab.* Borneo (Sarawak). Malacca.

This species is very widely distributed: we have seen examples from the islands of the Pacific, the Philippine Islands and Java; some specimens have the scutellum and post-scutellum black; in all probability the *S. ferruginea* of St. Fargeau is a variety of this insect.

#### 2. SPHEX NIGRIPES.

*Sphex nigripes*, *Smith, Cat. Hym.* pt. 4. p. 254 ♀.

*Hab.* Singapore. Sumatra.

#### 3. SPHEX DIABOLICUS. *S. ater*; metathorace densissime nigro-pubescent; alis flavo-hyalinis basi fuscis, apice subnubeculosus.

*Female.* Length 14 lines. Black; the head and thorax opaque; the mandibles very stout, forcipate, acute at their apex and having a stout tooth in the middle of their inner edge; their outer margins fringed with long hairs; the face thinly covered with black pubescence. Thorax: the metathorax covered with a dense black pubescence; a similar-coloured pubescence, but more sparing, clothes the thorax on the sides and beneath; wings flavo-hyaline, blackish at their base;



the apical margins of the anterior pair with a pale fuscous border ; the nervures ferruginous. Abdomen : sub-opake, smooth and slightly shining.

*Hab.* Borneo (Sarawak).

Gen. PELOPÆUS, *Latr.*

1. PELOPÆUS JAVANUS.

*Pelopæus Javanus*, *St. Farg. Hym.* iii. p. 309.

*Hab.* Borneo (Sarawak). Malacca. Java.

2. PELOPÆUS FERVENS. *P. ater* ; clypeo scapoque antice, pedibus abdomineque ferrugineis ; alis subhyalinis.

*Female.* Length 8 lines. Black ; the scape in front, the clypeus and tips of the mandibles ferruginous. Thorax : the posterior margin of the prothorax, the tegulæ, a transverse line at the base of the scutellum, the tips of the anterior and intermediate femora, the posterior pair, except their base, the tibiæ and tarsi, ferruginous ; the apical joints of the tarsi fuscous ; the wings subhyaline, with a black spot at the apex of the superior pair ; the nervures ferruginous ; the mesothorax finely striated transversely, the metathorax much more strongly so ; the head and thorax thinly covered with long thin pale pubescence. Abdomen : ferruginous, with the base of the petiole black ; the three apical segments fusco-ferruginous.

*Hab.* Borneo (Sarawak).

Fam. LARRIDÆ, *Leach.*

Gen. TACHYTES, *Panzer.*

1. TACHYTES NITIDULUS.

*Crabro nitidulus*, *Fabr. Piez. Syst.* 309. 7.

*Hab.* India. Borneo.

2. TACHYTES ARGENTATUS.

*Tachytes argentata*, *Brullé, Exped. Sc. de Morée*, iii. p. 372.

*Hab.* Singapore. The Morea. Albania.

3. TACHYTES AURIFEX. *T. ater* ; facie aurate pubescente ; pedibus ferrugineis ; alis flavo-hyalinis ; abdomine aurato-fasciato.

*Female.* Length  $10\frac{1}{2}$  lines. Black ; the face densely clothed with golden pubescence ; the cheeks and vertex behind, with a changeable golden pile ; the scape and mandibles at their base, ferruginous, the former black at their base above ; the palpi pale ferruginous. Thorax : with a changeable golden pubescence, very dense and shining on the posterior margin of the prothorax, the margins of the mesothorax and on the post-scutellum ; the tegulæ and legs ferruginous ; the coxæ and femora fuscous ; the wings flavo-hyaline, palest towards the apical margins, which have a pale fuscous narrow border. Abdomen :

fusco-ferruginous at the apex ; covered with a thin changeable golden pile ; each segment with a bright golden fascia on its apical margin ; beneath smooth and shining, with the apical margins of the segments rufo-piceous.

*Hab.* Borneo (Sarawak).

Gen. LARRADA, *Smith*.

1. LARRADA EXILIPES.

*Larrada exilipes*, *Smith, Cat. Hym.* pt. 4. p. 278.

*Hab.* Borneo (Sarawak).

2. LARRADA CARBONARIA. *L. nigerrima*; capite abdomineque nitidis; thorace opaco; alis rufescenti-fuscis, purpureo læte micantibus.

*Female.* Length 10 lines. Jet-black, shining; the clypeus delicately punctured; the flagellum fuscous; the cheeks with a fine cinereous pile. Thorax: the pro- and meso-thorax, the scutellum and post-scutellum closely punctured; the metathorax elongate, its superior surface finely shagreened; the truncation finely strigose; the tegulæ testaceous; the wings brown, with a brilliant violet iridescence; the legs strongly spinose. Abdomen: as long as the head and thorax, being smooth, shining and very delicately and sparingly punctured.

*Hab.* Singapore.

3. LARRADA SYCORAX. *L. nigerrima*, lævigata, nitida, punctata; alis fuscis violaceo-iridescentibus.

*Female.* Length  $7\frac{1}{2}$  lines. Jet-black; shining and finely punctured; the face and cheeks covered with silvery pubescence interspersed with long pale hairs; the metathorax oblong, truncated at the apex; the superior surface with a central impressed longitudinal line, on each side of which it is delicately striated obliquely. The thorax: beneath, the sides and also the legs, covered with a cinereous pile, and sprinkled with long white hairs; the wings brown, with a violet iridescence; their base, as well as the posterior pair, palest. Abdomen: smooth, shining and very delicately and distantly punctured; the margins of the segments slightly depressed and glittering in certain lights with silvery pile.

*Hab.* Borneo (Sarawak).

4. LARRADA POLITA. *L. nigra*; capite abdomineque nitidis; thorace opaco; femoribus tibiisque intermediis posticis ferrugineis; alis fusco-hyalinis.

*Female.* Length 6 lines. Black; the head shining, the clypeus closely and finely punctured and covered with silvery pile; the mandibles ferruginous. The pro- and meso-thorax closely punctured, thinly covered with a short glittering pubescence; the metathorax transversely rugose; the thorax on the sides and beneath covered with a fine changeable silvery pile; the intermediate and posterior femora and tibiæ, bright ferruginous; the wings fusco-hyaline and iridescent.

Abdomen : elongate, smooth, shining, and covered with a thin changeable glittering silvery pile; the apex acute and having a produced ferruginous style.

*Hab.* Borneo (Sarawak).

5. LARRADA TISIPHONE. *L. nigerrima*; capite thoraceque subopacis; metathorace reticulato; alis fusco-hyalinis.

*Female.* Length 4 lines. Black; the head very delicately and closely punctured, sub-opaque; the face and clypeus covered with silvery pubescence, the mandibles ferruginous at their apex; the cheeks with a bright silvery pile. Thorax: the pro- and mesothorax closely and finely punctured, the scutellum more delicately and sparingly so, the former sub-opaque, the latter shining; the metathorax coarsely reticulated; the tegulæ piceous; the wings fusco-hyaline and iridescent, the nervures black; the thorax beneath, and the legs, covered with a fine silky pile. Abdomen: smooth and shining, the apical margins of the segments with fasciæ of silvery pile, only observable in certain lights.

*Hab.* Borneo (Sarawak).

6. LARRADA ALECTO. *L. nigerrima*; capite thoraceque subopacis; metathorace reticulato; alis fusco-hyalinis.

*Female.* Length  $5\frac{1}{2}$  lines. Jet-black; the head shining; the cheeks with a silvery down; the clypeus impunctate; the mandibles ferruginous; the palpi rufo-testaceous. The mesothorax shining, closely and finely punctured; the scutellum shining; the metathorax rugose, more finely so towards the verge of the truncation, the latter transversely rugose; the tegulæ rufo-testaceous; wings fusco-hyaline, splendidly iridescent, with the nervures black; the legs strongly spinose, the knees somewhat ferruginous. Abdomen: smooth, shining and impunctate.

*Hab.* Singapore.

#### Gen. LARRA, *Fabr.*

1. LARRA PRISMATICA. *L. nigra*, pulchre prismatica, maculis fascisque variis flavis ornata.

*Female.* Length 4–5 lines. Black, with prismatic tints of violet and blue, particularly on the abdomen. The palpi, labrum, clypeus and a triangular space above it, an abbreviated line at the inner orbits of the eyes, the scape in front and the flagellum beneath, yellow; the clypeus emarginate in its entire width and a black transverse spot in the middle, a similar spot at the base of the labrum, which is rounded in front. The posterior margin of the prothorax, the tubercles, the outer margins of the tegulæ, an oblique spot on each side of the scutellum, a transverse line on the post-scutellum and an elongate spot on the lateral margins of the metathorax, yellow, the margins compressed; the anterior legs with the femora beneath and a spot at their apex above, and the tibiæ and tarsi in front, yellow, the claw-joint entirely so;

the intermediate legs with a line on the femora behind, a spot at their apex in front, the tibiæ in front as well as the tarsi, yellow; the posterior legs with a stripe on the tibiæ in front at their base; the wings hyaline and iridescent. Abdomen: an elongate transverse yellow macula on each side of the basal segment near its apical margin, a yellow fascia on the apical margin of the second segment, widest at the sides, an abbreviated fascia in the middle of the third, an entire one on the fourth, and a spot on each side of the fifth.

*Male.* Differs in having the clypeus black, two parallel abbreviated yellow lines on the disk of the mesothorax and the fasciæ on the abdomen entire, that on the basal segment being very broad and deeply notched in the middle.

*Hab.* Borneo (Sarawak).

I have here restored the name *Larra* to one of the insects agreeing with the type, *L. vespiformis*,—the *Stizus vespiformis* of many authors.

#### Gen. PISON, *Spin.*

1. PISON SUSPICIOSUS. *P. niger*; capite thoraceque rude punctatis; abdomine lævigato, nitido; facie pube argentea ornata.

*Female.* Length 4 lines. Black; the face with silvery pubescence; the palpi testaceous; the tips of the mandibles ferruginous; the head and thorax strongly and closely punctured, the clypeus finely so. Thorax: the tegulæ testaceous; the wings fusco-hyaline; the first recurrent nervure received at the apex of the first submarginal cell; the second at the apex of the second submarginal; the nervures dark fuscous; the metathorax with a number of coarse radiating striæ at its base; the truncation transversely rugose. Abdomen: very smooth and shining, with a few delicate scattered punctures; the margins of the segments depressed.

*Hab.* Singapore.

This species very closely resembles the *Pison rugosus*, but it differs from that species in the neururation of the wings, and also in the puncturing of the abdomen; I suspect that an example in fine condition would have silvery bands on the abdomen.

#### Subgen. PISONOIDES, *Shuck.*

*The anterior wings with one marginal cell, and two submarginal cells, each receiving a recurrent nervure.*

1. PISONOIDES OBLITERATUS. *P. ater*, glaber, tenuissime punctatus; facie argenteo-villosa; alis hyalinis iridescentibus; metathoracis basi lævi.

*Female.* Length  $3\frac{1}{2}$  lines. Black; the head and thorax punctured, the mesothorax rather distantly so; the clypeus and the notch of the eyes

with a silvery pubescence; the tips of the mandibles ferruginous; the tegulæ testaceous; the nervures brown; the costal nervure and the stigma black; the tibiæ and tarsi simple; the metathorax with a deep triangular depression at its base, which is obliquely striated on each side, and from which a deep smooth channel runs to the apex of the metathorax; on each side of the depression it is smooth and shining, and finely punctured beyond. Abdomen highly polished, with the margins of the segments deeply depressed; the apical margins with a fine short silky white pubescence; the sixth segment acute at the apex.

*Hab.* Borneo (Sarawak).

I have formed a section for the reception of this species, which I regard as a true *Pison*, having the petiolated cell obsolete, or rather the apical nervure of the usually enclosed cell. I have seen other species with the nervure obsolete in both, or sometimes only in one wing; the latter circumstance confirms my opinion of this species only being an exceptional case, and that it is a true *Pison*.

### Fam. BEMBICIDÆ, *Westw.*

#### Gen. BEMBEX, *Fabr.*

*Bembex melancholica*, *Smith, Cat. Hym.* pt. iv. p. 328.

*Hab.* Borneo (Sarawak). Sumatra.

### Fam. CRABRONIDÆ, *Leach.*

#### Gen. TRYPOXYLON, *Latr.*

1. *Trypoxylon bicolor*, *Smith, Cat. Hym.* pt. iv. p. 377.

*Hab.* Singapore. Madras.

2. *TRYPOXYLON PETIOLATUM*. *T. nigrum nitidum*, petiolo gracili elongato; abdominis articulis secundo et tertio ferrugineis.

*Female.* Length 7 lines. Black, very smooth and shining: the clypeus, the inner orbits of the eyes, the emargination of the eyes, and the cheeks, with a glittering silvery pile; the mandibles ferruginous; the palpi pale testaceous. Thorax: the tegulæ, anterior and intermediate tarsi, the extreme base of the posterior tibiæ, the calcaria, and the claws and pulvillus of the tarsi, pale rufo-testaceous; the apical joints of the tarsi fuscous; the sides of the thorax sprinkled with glittering silvery hairs; the wings hyaline, the nervures rufo-fuscous. Abdomen: the petiole slender, as long as the head and thorax, with the apex of its node, the second and third segments, ferruginous; covered with a fine changeable pile, only observable in certain lights.

*Hab.* Borneo (Sarawak).

3. *TRYPOXYON COLORATUM*. *T. nigrum*, læve, nitidum; pedibus pallide ferrugineis, abdomine subferrugineo supra, obscure maculato.

*Male*. Length  $7\frac{1}{2}$  lines. Black, smooth and shining: the clypeus, mandibles, palpi and scape of the antennæ, covered with golden pile; the cheeks and the emargination of the eyes with a glittering pale golden pile. Thorax: the posterior margin of the prothorax, the tegulæ, tubercles and legs, pale ferruginous; the intermediate and posterior tibiæ beneath, and also the tarsi, fuscous; the apex of the joints of the latter ferruginous; the wings hyaline, their nervures ferruginous, the stigma pale; the sides of the thorax and the metathorax with golden pubescence. Abdomen rufo-testaceous; the petiole, except its base, above, the node at its apex, above, as well as all the segments, more or less black, or rufo-fuscous above; the base and apex of the segments, as well as the apical segment entirely, pale; beneath entirely pale.

*Hab.* Borneo (Sarawak).

This species is about the size of *T. bicolor*, which it very much resembles, but from which it is very distinct.

#### Gen. CRABRO, *Fabr.*

1. *CRABRO FAMILIARIS*. *C. niger*, ocellis triangulariter ordinatis, mesothorace punctulato, pedibus flavis, metathorace lævi nitido, abdomine pubescente.

*Male*. Length  $2\frac{1}{2}$  lines. Black: head a little wider than the thorax, shining and delicately punctured; the stemmata in a triangle; the clypeus and cheeks with silvery pubescence; the scape yellow; the flagellum rufo-testaceous, slightly fuscous above; the palpi pale testaceous; the mandibles ferruginous at their apex. Thorax: the collar, tubercles, tegulæ, scutellum and post-scutellum, the extreme base of the wings, and the legs, of a sulphur-yellow; the wings hyaline and splendidly iridescent; the base of the femora and the coxæ slightly ferruginous; the mesothorax delicately punctured; the metathorax smooth and shining, with a central impressed fovea. Abdomen pubescent, with the apical margins of the segments rufo-piceous.

*Hab.* Borneo (Sarawak).

2. *CRABRO RUGOSUS*. *C. niger*, ocellis triangulariter ordinatis in vertice, mesothorace longitudinaliter striato, metathorace rugoso.

*Male*. Length  $2\frac{1}{2}$  lines. Black: head wider than the thorax, quadrate; the stemmata in a triangle on the vertex; an impressed line in front of the anterior stemma extending to the sulcation on the face; an impressed line running round the orbits of the eyes; the cheeks and face with a dense silvery pubescence; the scape yellow; the tips of the mandibles ferruginous. Thorax: an interrupted line on the collar, the tubercles, two spots on the scutellum, the post-scutellum, the tips of the anterior femora, all the tibiæ at their base,

and the basal joint of the tarsi, yellow; the apical joints of the tarsi rufo-fuscous; the yellow markings on the legs paler than those on the thorax; the mesothorax deeply striated longitudinally; the metathorax rugose; the wings hyaline and iridescent. Abdomen: the four basal segments with a small ovate yellow spot at their extreme lateral margins; the fifth with a yellow fascia at its base.

*Hab.* Borneo (Sarawak).

This species has a remarkably close resemblance to the *Crabro Panzeri* of this country.

### Gen. MELLINUS, *Fabr.*

1. MELLINUS CRABRONIFORMIS. *M. niger*, scapo palpis mandibulis tuberculis pedibusque flavis, abdomine ferrugineo.

*Female.* Length 4 lines. The head and thorax black; the legs and abdomen pale ferruginous; the head and thorax with a thin glittering pale golden pubescence; the palpi, mandibles and scape of a yellowish white; the flagellum testaceous, yellow beneath. Thorax smooth and shining; the tegulæ and base of the wings of a yellowish white; the wings hyaline and splendidly iridescent; the nervures testaceous; the metathorax with a subenclosed space at its base, with a row of sulcations along the basal margin; the sides and apex of the metathorax rugose. Abdomen pale ferruginous, smooth, shining and pubescent; the basal segment petiolated, the petiole curved, clavate at the apex.

*Hab.* Borneo (Sarawak).

I am aware that this insect, if a strict adherence to the neururation of the wings, as a character for generic subdivision, were rigidly adopted, would form a type of a new genus, but the difference is too slight in my opinion to justify such a course; in other respects it agrees with the insects included in the genus *Mellinus*; the principal difference in the neururation of the present species is the elongation of the third discoidal cell.

### Gen. CERCERIS, *Latr.*

1. CERCERIS SEPULCRALIS. *C. capite thoraceque nigris, abdomine ferrugineo.*

*Female.* Length  $7\frac{1}{2}$  lines. Black, with the abdomen ferruginous; the head and thorax finely shagreened; the face with a silvery-white pubescence; the carina between the antennæ, an ovate spot on the clypeus, and the mandibles, obscurely rufo-testaceous. Thorax: a minute obscure spot on the posterior margin of the prothorax, laterally, and a distinct spot on the tegulæ in front, pale yellow; the wings brown, their base subhyaline; the sides of the metathorax covered with hoary pubescence; an indistinct pale spot on the inter-

mediate and posterior tibiæ, outside; the apical joints of the anterior tarsi, and the calcaria, pale testaceous; the tarsi beneath, and the posterior tibiæ within, clothed with a golden-yellow pubescence.

*Hab.* Borneo (Sarawak).

## Group SOLITARY WASPS.

### Fam. EUMENIDÆ.

#### Gen. GAYELLA, *Saussure*.

1. *GAYELLA PULCHELLA*. *G. nigra*, punctata, subnitida, flavo-guttata et fasciata, pedibus ferrugineis flavo-guttatis, alis subhyalinis et iridescentibus.

*Female*. Length 10 lines. Black: head quadrate; the clypeus deeply emarginate in front, the angles of the emargination produced and denticulate; a large oblong spot behind the eyes, two oblique lines on the vertex nearly touching the summit of the eyes and inclined inwards, a stripe at the base of the scape in front, the labrum and mandibles, yellow. Thorax: the prothorax in front, two longitudinal abbreviated lines on the disk of the mesothorax, the tegulæ in front and behind, a slightly interrupted transverse line on the scutellum and post-scutellum; a spot beneath the wings, and the sides of the metathorax, yellow; the legs ferruginous; a stripe on the anterior femora outside, another on the anterior and intermediate tibiæ, and a spot at the apex of the posterior pair, yellow; the tibiæ and tarsi fuscous; the wings fusco-hyaline; the anterior margin of the superior pair yellowish, their apex slightly clouded. Abdomen: the lateral and apical margins of the petiole, an ovate spot on each side of the basal segment, a fascia a little before the apical margins of the first, second and third segments, yellow; beneath black.

*Hab.* Borneo (Sarawak).

#### Gen. EUMENES.

1. *Eumenes flavopicta*.

*Eumenes flavopicta*, *Blanch. Dict. d'Hist. Nat. de Ch., d'Orb. Ins.* pl. 2. fig. 2.

*Hab.* Singapore.

2. *Eumenes Blanchardi*, *Sauss. Mon. Guêpes, Sol.* p. 66.

*Hab.* Borneo (Sarawak).

3. *Eumenes quadrispinosa*, *Sauss. Mon. Guêpes, Suppl.* p. 134. pl. 7. fig. 2 ♀.

*Hab.* Malacca.

4. *Eumenes xanthura*, *Sauss. Mon. Guêpes, Sol.* p. 46.

*Eumenes circinalis*, *Fabr. Syst. Piez.* p. 286 (var.?).

*Hab.* Borneo (Sarawak).



5. *Eumenes hæmorrhoidalis*.

*Vespa hæmorrhoidalis*, *Fabr. Syst. Piez.* p. 259.

*Hab.* Borneo (Sarawak).

6. *Eumenes quadrata*, *Smith, Trans. Ent. Soc. Lond.* n. ser. ii. p. 36.

*Hab.* Borneo (Sarawak).

The specimens from Sarawak only differ from those from China in having the tibiæ and tarsi paler.

7. *EUMENES INCONSPICUA*. *E. nigra* flavo-variegata, capite thoraceque dense punctato, abdomine sublævigato nitido.

*Female.* Length 5 lines. Black: the clypeus deeply emarginate at the apex, the angles acute; the basal portion of the clypeus yellow, with a yellow spot above between the antennæ, and a narrow abbreviated yellow line behind the eyes; the tips of the mandibles, and the apex of the flagellum beneath, ferruginous. Thorax: an abbreviated line on the posterior margin of the prothorax in the middle, a spot beneath the wings and another before it, the tegulæ, a spot behind them, the post-scutellum, two spots on each side of the metathorax, the tips of the femora and the tibiæ, yellow; the anterior tarsi yellow, the intermediate and posterior pairs dusky; the intermediate and posterior tibiæ fusco-ferruginous beneath; wings subhyaline, the anterior margin of the superior pair fuscous. Abdomen: a minute spot on each side of the petiole, its apical margin, a larger spot on each side of the second segment and its apical margin, yellow; the following segments with a silky pubescence.

*Hab.* Borneo (Sarawak).

8. *EUMENES SINGULARIS*. *E. nigra* flavo-variegata, capite thorace petioloque (ad apicem excepto) rude punctato; abdomine lævigato nitido.

*Female.* Length 6 lines. Black: the basal and the lateral margins of the clypeus, an oblong spot between the antennæ, a minute spot in the sinus of the eyes and a short line behind them, yellow; the apex of the antennæ ferruginous beneath. Thorax suborbicular; the prothorax in front, two spots on each tegula and another behind them, a transverse line on each side of the metathorax at its base, two ovate ones at its apex, and a spot beneath the wings, yellow; the anterior femora at their apex, the tibiæ, and the intermediate and posterior tibiæ outside, yellow; the wings fusco-hyaline, and iridescent, their apical margins darkest. Abdomen: the petiole longer than the head and thorax; the apical margin of the petiole, an ovate spot on each side of the first segment, its apical margin, and a line in the middle of that of the following segment, yellow; the thorax and abdomen beneath with a fine griseous pile.

*Hab.* Borneo (Sarawak).

Gen. RHYNCHIUM, *Spinola*.1. *Rhynchium hæmorrhoidale*.*Vespa hæmorrhoidalis*, *Fabr. Syst. Piez.* p. 259.*Hab.* Singapore. Malacca.2. *Rhynchium sanguineum*, *Sauss. Mon. Guêpes, Sol.* p. 110 (var. *R. hæmorrhoidalis*).*Hab.* Borneo (Sarawak).3. *Rhynchium metallicum*, *Sauss. Mon. Guêpes, Sol.* p. 114.*Hab.* Borneo (Sarawak).4. *Rhynchium nitidulum*.*Vespa nitidula*, *Fabr. Syst. Piez.* p. 260.*Hab.* Borneo (Sarawak).

The specimens from Borneo have the clypeus strongly punctured; in other respects they agree precisely with Indian and Javanese examples.

5. RHYNCHIUM OBSCURUM. *R. capite thoraceque rude punctatis, alis apice nigris, abdominis segmento primo rubro-fasciato.*

*Female.* Length 6 lines. Black: the head and thorax very coarsely punctured; the margins of the clypeus covered with silvery pile; the face with scattered, short, griseous pubescence. Thorax: the tegulæ black and shining; the wings fusco-hyaline; a dark stain along the anterior margin of the externo-medial cell, and a dark fuscous cloud beyond the second submarginal cell occupying the entire apex of the wings. Abdomen: opaque black, the apical margin of the first segment with an obscure ferruginous band; the apical margins of the following segments slightly and very obscurely ferruginous, and covered with fusco-ferruginous pubescence.

*Hab.* Borneo (Sarawak).Gen. ODYNERUS, *Latr.*1. *Odynerus flavo-lineatus*, *Smith, Cat. Hym.* pt. v. p. 60.*Hab.* Malacca (Mount Ophir). Java.2. ODYNERUS MANIFESTUS. *O. niger, capite thoraceque rude et confluentè punctatis, clypeo scapo pedibus et prothorace flavo-guttatis, abdomine fasciis duabus flavis ornato.*

*Male.* Length 5 lines. Black: the head and thorax covered with deep coarse confluent punctures; a spot on each side of the clypeus, a line on the scape in front, and another behind the eyes, yellow; the clypeus produced and truncate in front. Thorax: a line on the posterior margin of the prothorax in the middle, a spot on the tegulæ in front and behind, the post-scutellum, the apex of the anterior and intermediate femora, and all the tibiæ outside, yellow; the tarsi black; wings subhyaline, the nervures black; the anterior margin of the

superior pair fuscous. Abdomen shining and delicately punctured; the first and second segments with a yellow fascia on their apical margins.

*Hab.* Borneo.

3. *ODYNERUS SEPTEM-FASCIATUS*. *O. niger* capite thoraceque profunde punctatis flavoque variegatis, abdominis segmentis flavo-marginatis, segmento secundo flavo-fasciato.

*Male*. Length 5 lines. Black: head and thorax deeply, but not coarsely punctured; the margins of the clypeus, the labrum, mandibles, scape in front, the sinus of the eyes, a longitudinal stripe running from the anterior stemma to the insertion of the antennæ, and a line behind the eyes, yellow. Thorax: a transverse line on the prothorax in front, not touching its anterior angles, two longitudinal abbreviated lines on the disk of the mesothorax, the tegulæ, two spots on the scutellum, the post-scutellum, the sides of the metathorax, a spot beneath the wings, an oblique line beneath it, and a similar line running down to the posterior coxæ, yellow; the legs yellow, with a fuscous line on the femora above and on the tibiæ behind. Abdomen: the anterior, posterior and lateral margins of the basal segment yellow; a fascia across the middle of the second segment, and another a little before its apical margin, and also before the margins of the three following segments, yellow; beneath, the second segment yellow, with an oblong black spot in the middle; the apical margins of the three following segments yellow.

*Hab.* Borneo (Sarawak).

4. *ODYNERUS MACULIPENNIS*. *O. niger*, punctatus, capite thoraceque flavo-guttatis, abdominis segmentis singulis flavo-fasciatis, alis apice nigro unimaculatis.

*Female*. Length  $3\frac{1}{2}$  lines. Black: the clypeus, mandibles, antennæ beneath, a spot between them, another in the sinus of the eyes, and a stripe behind them, yellow; the antennæ rufo-fuscous above; the mandibles ferruginous at their apex. Thorax: the anterior margin of the prothorax, the tegulæ and a spot behind them, a spot beneath the wings, the scutellum, a line on the post-scutellum and the sides of the metathorax, yellow; the legs yellow, with the coxæ and the femora above, more or less fuscous; the wings hyaline, with a black spot occupying the greater part of the marginal cell and passing off beyond it to the apex of the wings; the nervures fuscous. Abdomen shining and delicately punctured; the first segment short and cup-shaped, its apical margin thickened; the second segment much wider than the first, its sides rounded; a yellow fascia on the apical margins of the segments, that on the third segment much narrower than the others; an ovate spot on each side of the second segment, at its lateral margins, at the base.

*Hab.* Borneo (Sarawak).

This species is closely allied to the *O. miniatus* of Saussure.

5. *ODYNERUS MULTIPICTUS*. *O. niger*, capite thoraceque rude punctatis et flavo-variegatis, pedibus flavis, alis hyalinis apice fuscatis, abdomine flavo-fasciato.

*Female*. Length  $5\frac{1}{2}$  lines. Black: the head and thorax rugose-punctate; the mandibles, clypeus, sinus of the eyes, a longitudinal line running from the anterior ocellus to the insertion of the antennæ, a parallel line on each side of the ocelli touching the eyes, a broad stripe behind the eyes, and the scape in front, yellow; a black spot in the centre of the clypeus, and the apex of the mandibles, ferruginous; the flagellum fulvous beneath. The prothorax in front, two longitudinal lines on the mesothorax, two ovate spots on the scutellum, the sides of the metathorax with a large angular spot, the tegulæ, a spot and an oblique line beneath them, and also the legs, yellow; a line on the femora above and on the tibiæ behind, and the coxæ spotted with fuscous; a black spot on the tegulæ; the wings subhyaline and iridescent; a dark cloud on the anterior margin of the superior pair towards their apex. Abdomen smooth and shining; a yellow fascia on the apical margins of the segments, and also a fascia at the base of the first segment, with a transverse spot on each side of the second segment; beneath, the second segment yellow, with a black quadrate spot at its base, a yellow fascia on the apical margins of the following segments

*Hab.* Borneo (Sarawak).

6. *ODYNERUS LATIPENNIS*. *O. niger*, angustus, elongatus, alis amplis apice nigro-maculatis, capite thoraceque flavo-guttatis, pedibus flavis, abdomine flavo-fasciato.

*Female*. Length 6 lines. Black: head and thorax strongly punctured; the clypeus, and an ovate spot above, from which a narrow line runs up to the anterior ocellus, the sinus of the eyes, a stripe behind them and the scape in front, yellow; the flagellum fulvous beneath; the tips of the mandibles ferruginous. Thorax elongate; the prothorax in front, the tegulæ, two spots on the scutellum, and the metathorax, yellow; a longitudinal black line in the middle of the latter; a yellow spot beneath the wings and an oblique line behind it; the legs yellow; the wings very large, subhyaline and iridescent; the nervures towards the base of the wings fusco-ferruginous, towards their apex they are pale testaceous; the costal and externo-medial cells with a slight fuscous cloud; a dark cloud occupying the apical half of the marginal cell and passing on to the apex of the wings. Abdomen: the basal segment campanulate, the apical margins of the segments with yellow fasciæ.

*Hab.* Borneo (Sarawak).

This species belongs to the subgenus *Symmorphus*.

Group **SOCIAL WASPS.**Fam. **VESPIDÆ.**Gen. **ISCHNOGASTER**, *Guérin*.

1. *Ischnogaster cilipennis*, *Smith, Cat. Hym.* pt. v.

*Hab.* Borneo (Sarawak). Malacca (Mount Ophir).

2. *Ischnogaster Mellyi*, *Ann. Soc. Ent. Fr.* 2<sup>e</sup> sér. x. p. 25. pl. 2. f. 1.

*Hab.* Malacca. Sarawak.

3. **ISCHNOGASTER NIGRIFRONS.** *I. niger*, subtus flavo-variegatus, cellulis primo secundoque submarginalibus æquis, tertia breviori et ad cellulam marginalem angustata.

*Female.* Length 6 lines. Black: the face and clypeus covered with pale golden pubescence, the colour changing in different lights; the clypeus produced at its apex into an acute spine; the scape in front, the flagellum beneath, the palpi and mandibles, yellow, the latter ferruginous at their apex. Thorax globose; the posterior margin of the prothorax, two oblique lines on the mesothorax anteriorly, a spot on each side of the scutellum, the post-scutellum, and two spots at the apex of the metathorax close to the insertion of the petiole, yellow; beneath, fusco-ferruginous; the legs rufo-piceous, with the knees and the anterior and intermediate tibiæ outside, yellow. Abdomen obscurely rufo-fuscous; the first segment petiolated; beneath, with two lines at the base of the node of the petiole; the extreme lateral margins of the first segment, two oblique ones towards its apex beneath, an ovate spot on each side of the two following segments beneath, and the extreme lateral basal margin of the second segment above, yellow.

*Hab.* Borneo (Sarawak).

4. *Ischnogaster micans*, *Sauss. Mon. Guêpes, Soc.* p. 8.

*Hab.* Borneo (Sarawak). Malacca.

Gen. **POLISTES**, *Latr.*

*Polistes sagittarius*, *Sauss. Mon. Guêpes, Soc.* p. 56.

*Hab.* Borneo (Sarawak). India. China. Greece.

There is probably no species of this genus which is so widely distributed as the present; the specimens which I have seen from Borneo are all smaller than the Indian ones, and are more highly coloured; the mesothorax has a central longitudinal ferruginous stripe, and the metathorax two longitudinal ones.

Gen. **POLYBIA**, *Sauss.*

1. *Polybia Sumatrensis*, *Sauss. Suppl. Guêpes, Soc.*

*Hab.* Sumatra. Borneo (Sarawak). Malacca.

2. *POLYBIA STIGMA*. *P. nigra*, flavo-variegata, alis anticis hyalinis, margine antico obscurato, stigmatè flavo.

*Male*. Length 5 lines. Black: the clypeus and cheeks with a silvery pubescence; the mandibles, clypeus, sinus of the eyes, the antennæ beneath, and the cheeks, yellow. Thorax: the anterior margin of the prothorax, the tegulæ and a line beneath the wings, a broad oblique stripe on the sides of the metathorax, the scutellum, post-scutellum, and an oblong-quadrate spot beneath it, and also the legs, yellow; the femora and tibiæ slightly fuscous behind; the anterior wings with a dark spot at the apex of the externo-medial cell; the stigma honey-yellow, with a dark stripe beyond it at the margin of the wing. Abdomen: an ovate spot on each side of the second segment at its base, and a yellow fascia on the apical margin; the extreme apex of the abdomen yellow; the fascia on the second segment, continued beneath, and two ovate maculæ at its base.

*Hab.* Borneo (Sarawak).

This is probably the male of *P. decorata*.

3. *POLYBIA LUCTUOSA*. *P. opaca*, nigra, clypei margine antico flavo, segmentis primo tertio quartoque abdominis flavo-marginatis, alis apice nigro uni-maculatis.

*Female*. Length  $5\frac{1}{4}$  lines. Black: the anterior margin of the clypeus, slightly interrupted in the middle, and a very narrow line at the inner orbits of the eyes, not entering the sinus, yellow; the head and thorax opaque; wings hyaline, with a black spot on the anterior margin of the superior pair, near their apex. Abdomen: a narrow yellow fascia on the apical margins of the first, third and fourth segments, the extreme apex yellow.

*Hab.* Borneo (Sarawak).

4. *POLYBIA DECORATA*. *P. nigra*, flavo multidecorata, pedibus flavis.

*Female*. Length 5 lines. Black: the clypeus, mandibles, antennæ beneath, the sides of the face and sinus of the eyes, a spot above the clypeus running up into a point as high as the anterior ocellus, and two minute spots on the margin of the vertex, yellow. Thorax: the anterior margin of the prothorax, the tegulæ, and a large broad oblique spot beneath the wings, two longitudinal lines on the mesothorax, the scutellum and post-scutellum, the metathorax and legs, yellow; the scutellum and metathorax with a longitudinal black line down the middle; the wings subhyaline, with a fuscous cloud in the marginal cell; the tibiæ outside, and the tarsi above, slightly fuscous. Abdomen: the first segment campanulate, with a yellow spot on each side at its apex; the second segment with two very large spots at its base occupying nearly half the length of the segment, and nearly uniting its apical margin as well as those of the three following, with a marginal fascia, yellow; the apical segment entirely yellow; beneath

yellow, with only the apical margins of the segments narrowly fuscous.

*Hab.* Borneo (Sarawak).

Gen. ICARIA, *Saussure*.

1. *Icaria opulenta*, *Smith, Cat. Hym.* pt. v. p. 99. ♀.

The male of this species has been received from Borneo since I described the female, from which it only differs in having the clypeus and mandibles entirely black; in other respects they agree.

2. *Icaria speciosa*, *Sauss. Rev. Zool. (Guérin, 1855)* p. 374.

*Hab.* Borneo. Malacca. Sumatra.

3. *Icaria ferruginea*, *Fabr.*

*Polistes ferruginea*, *Fabr. Syst. Piez.* p. 277.

*Hab.* Malacca (Mount Ophir). India.

4. ICARIA LUGUBRIS. *I. opaca nigra pube sericea variabili vestita, alis subhyalinis, apice nigro subnebulosis.*

*Female.* Length 6 lines. Black: covered with a fine changeable white silky pile; head opaque, delicately roughened; the clypeus angular in front and with a broad white margin, smooth and shining anteriorly; the mandibles smooth and shining, with a white spot at their base. Thorax finely rugose; the sides of the prothorax, the scutellum and post-scutellum, very obscurely tinged more or less with ferruginous, sometimes not observable; the wings subhyaline, with a dark brown stain at the apex of the externo-medial cell, a similar stain occupies the marginal cell, and a paler cloud descends from it across the apex of the wing. Abdomen: the apex of the petiole and the apical margins of the third and following segments very indistinctly tinged with ferruginous, generally black; the third and following segments densely covered with silky pile.

In my Catalogue of Vespidae, I have indicated this species as being a black variety of *I. speciosa*; I had only one or two examples at that time for examination; but having now a series, I am satisfied of their being distinct: in *I. speciosa* the first segment of the abdomen is as broad as long, in the present it is longer than broad.

*Hab.* Borneo (Sarawak).

5. ICARIA MODESTA. *I. nigra, alis fulvo-hyalinis, abdomine ferrugineo.*

*Female.* Length 5 lines. Black: the head and thorax roughly punctured; the face and cheeks with short griseous pubescence; the clypeus angular in front, produced into an acute point. Thorax: the posterior margin of the prothorax ferruginous in the middle; the apical joints of the tarsi ferruginous; wings fulvo-hyaline, the ner-

vures dark ferruginous towards the base of the wings, and pale ferruginous towards their apex. Abdomen dark ferruginous, somewhat obscure; the first segment and base of the second bright red; the sides and the apex of the abdomen with a fine silky white pile.

*Hab.* Borneo (Sarawak).

Gen. *VESPA*, *Linn.*

1. *Vespa cincta*, *Fabr. Syst. Piez.* p. 254.

*Hab.* Borneo (Sarawak). Malacca (Mount Ophir).

2. *Vespa affinis*, *Fabr. Syst. Piez.* p. 254 (var. *V. cincta*?).

*Hab.* Malacca.

3. *Vespa tyrannica*, *Smith, Cat. Hym.* pt. 5. p. 119.

*Hab.* Singapore.

4. *Vespa (anomala) dorylloides*, *Sauss. Mon. Guêpes, Soc.* p. 112.

*Hab.* Borneo (Sarawak). Malacca. Singapore.

5. *Vespa bellicosa*, *Sauss. Mon. Guêpes, Soc.* p. 146.

*Hab.* Borneo (Sarawak).

6. *VESPA ANNULATA*. *V. nigra*, scutello flavo-maculato, post-scutello metathoraceque flavis, illo in summo nigro, segmentis tenuibus flavo marginatis.

*Worker.* Length 10 lines. The clypeus emarginate in front, its lateral angles acute and slightly produced; an elongate-quadrate black spot in the middle not extending to the anterior margin; the cheeks, mandibles, clypeus, a coronet-shaped spot above, the emargination of the eyes, the scape in front and the flagellum beneath, yellow. Thorax: a narrow line on the anterior and posterior margins of the prothorax, the tegulæ and a spot beneath the wings, an ovate spot on each side of the scutellum, the post-scutellum and metathorax, yellow; wings subhyaline, with a narrow fuscous stain at the anterior margin of the superior pair; legs yellow, with a fuscous stain on the tibiæ and femora above. Abdomen: two large spots at the base of the first segment, and a narrow fascia on the apical margins of all the segments, yellow; the yellow bands abruptly widened laterally; the abdomen yellow beneath, with the base of the segments blackish.

*Hab.* Borneo (Sarawak). Malacca.

Fam. *TENTHREDINIDÆ*, *Leach.*

1. *TENTHREDO COXALIS*. *T. chalybea*, clypeo palpis trochanteribus coxarum apicibus tibiisque postice albis, alis hyalinis.

*Female.* Length 4 lines. Steel-blue; the antennæ black; the clypeus and palpi white. Thorax: a line before and a spot beneath the tegulæ,



the trochanters, apex of the coxæ, the knees and the tibiæ behind, white; the wings hyaline and iridescent; the nervures and stigma dark brown; two minute white spots on the post-scutellum; the extreme apex of the abdomen with a white spot.

*Hab.* Singapore.

Gen. **TREMEX**, *Jurine*.

1. **TREMEX INSULARIS**. *T. ater*, capite thorace disco viridibus, abdomine et thorace flavo-variegatis, alis subhyalinis, margine antico fuscis.

*Female*. Length 8 lines. Head brassy-green, strongly punctured; the antennæ black with the apical joints yellow; the face thinly covered with white pubescence. Thorax: the disk and the scutellum with a green tinge; the pro- and metathorax above yellow; the segments of the abdomen have each a yellow fascia, the first two slightly interrupted, the terminal segment with an oblique yellow stripe on each side; the tibiæ yellow, the tarsi ferruginous; the base of the abdomen yellow beneath; the wings subhyaline, a dark fuscous stain along the anterior margin of the superior pair, the apical margins of both wings fuscous.

*Hab.* Borneo (Sarawak).

Fam. **CYNIPIDÆ**, *Westw.*

1. **CYNIPS INSIGNIS**. *C. flavo-ferruginea*, antennis fuscis, alis flavo-hyalinis apice fuscis.

*Female*. Length  $4\frac{1}{2}$  lines. Reddish-yellow, smooth and shining, rather paler beneath; the flagellum slightly fuscous, with the base and apex pale; tips of the mandibles black; the mesothorax deeply and transversely grooved; the base of the wings flavo-hyaline; from the base of the stigma to the apex dark fuscous; the insect is thinly covered with a short pale pubescence; the ovipositor black; the sheath and the claws dark ferruginous.

*Hab.* Borneo (Sarawak).

Fam. **ICHNEUMONIDÆ**, *Leach*.

1. **ICHNEUMON PENETRANS**. *I. niger*, capite thoraceque flavo variegatis, pedibus flavis nigro-maculatis, abdominis annulis flavo-marginatis.

*Female*. Length 8 lines. Black: the face below the insertion of the antennæ, the labrum, mandibles, palpi, cheek, inner orbits of the eyes, and the antennæ, yellow; the scape and base and apex of the flagellum black: a black spot above the clypeus, and the apex of the mandibles ferruginous. Thorax: the lateral margins of the prothorax, a

spot on the tegulæ, two longitudinal spots on the mesothorax, the scutellum, post-scutellum, two spots on the metathorax behind and a line at the sides, two oblique maculæ on the sides of the thorax and the legs, yellow; the anterior and intermediate legs with a fuscous line outside; the posterior femora and the apex of the tibiæ black; wings hyaline. Abdomen: the base of the petiole and its apical margin yellow; the base of the first segment and the apical margins of all the segments with a yellow fascia; beneath entirely yellow.

*Hab.* Borneo (Sarawak).

2. *ICHNEUMON COMISSATOR*. *I. niger*, antennis medio albis, thorace pedibusque flavo variegatis, abdominis petioli basi marginibus basilibus segmentorum trium sequentium duobusque segmentis apicalibus flavis.

*Male*. Length 7 lines. Black: antennæ white in the middle; the head is yellow, except the hinder part of the vertex, and a black stripe running from the vertex to the insertion of the antennæ. The prothorax has the anterior and posterior margins yellow; the tegulæ, two spots on the disk of the mesothorax, the scutellum and post-scutellum, and metathorax, yellow; a black spot on the tegulæ, another on the scutellum, and a black T-shaped mark on the metathorax; the thorax with yellow maculæ on the sides, and the legs yellow; the anterior and intermediate legs with a black line outside, and the posterior femora and apex of the tibiæ black. The petiole of the abdomen yellow, with a black macula at its apex; the first, second and third segments with a broad, deeply emarginate fascia at their base; the two apical segments entirely yellow.

*Hab.* Borneo (Sarawak).

#### Gen. *CRYPTUS*, *Fabr.*

1. *CRYPTUS CROCEIPES*. *C. niger*, metathorace bispinoso, antennis medio tarsisque posticis et abdomine apice albis, pedibus flavis.

*Female*. Length 5 lines. Black: subopake, with the apex of the abdomen white above; the middle of the antennæ, above, white about one-third of their length; the legs yellow; the posterior tibiæ and claw-joint of the tarsi, and also the anterior tarsi, fuscous; the posterior tarsi white; the wings hyaline and iridescent, with a faint cloud at the apex of the first submarginal cell, the stigma and nervures, black; the metathorax armed with two short spines which are white at their tips.

*Hab.* Borneo (Sarawak).

2. *CRYPTUS ELEGANS*. *C. niger*, antennis medio scutelloque et abdominis apice albis, alis hyalinis macula fusca ad apicem, abdominis fasciis albis, thorace bispinoso.

*Female.* Length  $4\frac{1}{2}$  lines. Black: the scape pale rufo-testaceous, the apical half of the flagellum and the palpi white; the apex of the flagellum, and the outside of the white portion, fuscous. The tegulæ, scutellum, a line on the post-scutellum, and the posterior tarsi, white; the legs pale rufo-testaceous; the metathorax rugose and armed with two white spines; the wings hyaline, with a fuscous stain descending from the stigma to the inferior margin of the discoidal cell. Abdomen: the basal segment rufo-testaceous at the base and white at its apical margin; the second segment black at its base, then rufo-testaceous, becoming white at its apical margin; the apex of the abdomen white.

*Hab.* Borneo (Sarawak).

3. *CRYPTUS LEPIDUS.* *C. niger*, alis hyalinis, tarsis posterioribus albo-, metathorace transverso-striatis, abdominis apice albo.

*Female.* Length 6 lines. Black; shining: antennæ white in the middle; the wings hyaline, the nervures black; the anterior and intermediate legs, and the posterior coxæ, reddish-yellow; the anterior and intermediate tarsi fuscous, the posterior pair white; the three apical segments white above; the posterior margins of the second and third segments with very narrow white fasciæ; the metathorax transversely striated.

*Hab.* Borneo (Sarawak).

#### Gen. PIMPLA, *Fabr.*

1. *Pimpla punctator.*

*Ichneumon punctator*, *Linn. Syst. Nat.* i. 935. 38.

*Pimpla pedator*, *Fabr. Syst. Piez.* p. 114. 6.

*Hab.* India. Borneo (Sarawak).

#### Gen. MEGAPROCTUS, *Brullé.*

1. *MEGAPROCTUS RUFICEPS.* *M. niger*, capite ferrugineo, thorace abdominisque segmento primo et secundo rugosis, alis hyalinis, tarsis posterioribus albis.

*Female.* Length 8 lines. Head and scape of the antennæ ferruginous, smooth and shining; the flagellum and tips of the mandibles black. Thorax opaque black, rugose, but not coarsely so; the mesothorax convex in front, sub-bituberculate, the tubercles obsoletely ferruginous; the wings hyaline, the nervures black; the base of the tibiæ, the apex of the first and second joints of the anterior tarsi, the third and fourth entirely, the intermediate pair wanting, and the posterior pair, white; the claw-joint of the latter black. Abdomen opaque black, broad at the base and slightly widening to the apex; the first segment and a large angular shape in the middle of the second with large close punctures; on each side of the angular shape it is longi-

tuinally rugulose; the apical segments smooth and shining; the ovipositor a little longer than the insect.

*Hab.* Singapore.

Gen. RHYSSA, *Grav.*

1. RHYSSA MIRABILIS. *R.* capite thorace pedibus anticis et intermediis sanguineo-rubris, coxis intermediis antice posticisque a tergo, albis, alis fuscis, abdomine basi nigro sensim ad apicem pallidiore, apice flavescenti-albo, ovipositore elongato.

*Female.* Length 13 lines. Head, thorax and anterior legs ferruginous; the mandibles black; wings dark fuscous, with a coppery effulgence; the intermediate and posterior legs dark rufo-piceous; the intermediate coxæ in front and the posterior pair behind, white; the intermediate tibiæ ferruginous in front, the tarsi fuscous; the apex of the metathorax above black, smooth and shining. Abdomen smooth and shining, black at the base, and gradually becoming paler to the apex, which is pale yellowish-white; the apical segments deeply emarginate in the middle above; the ovipositor one-third longer than the body.

*Hab.* Borneo (Sarawak).

2. RHYSSA MACULIPENNIS. *R.* nigra, flavo dense maculata, alis anticis macula magna fusca ad apicem.

*Female.* Length 10 lines. Black: the face, inner and outer orbits of the eyes, and a spot on the scape in front, yellow. Thorax: the posterior margin of the prothorax, the tegulæ and two spots beneath the wings, the scutellum and a minute spot on each side, at its anterior angles, a spot on the post-scutellum, a trilobate spot on the metathorax, in the middle, and a large irregular macula at the sides, yellow; the legs yellow; the tarsi fuscous; the anterior coxæ behind and the femora and tibiæ outside with a rufo-piceous stain, the intermediate and posterior black and spotted with yellow, the femora black above, the tibiæ fuscous at their base behind; the wings hyaline, with a faint yellow tinge, the nervures black, the stigma ferruginous; a large dark brown macula on the anterior wings placed at the apex of the stigma. Abdomen: a longitudinal yellow spot in the middle of the two basal segments, and an oblique ovate yellow spot at the sides of the three following segments towards their apical margins; the ovipositor one-fourth longer than the body.

*Hab.* Borneo (Sarawak). Singapore.

Gen. MEGISCHUS, *Brullé.*

1. MEGISCHUS INSULARIS. *M.* niger, capite ferrugineo, thorace abdominisque segmento primo rugosis, alis subhyalinis, ovipositore ad apicem albo annulato.

*Female.* Length 10 lines. Black: the head red, coarsely rugose, having three or four deep transverse curved grooves above the ocelli, in front

of which is a triangular shallow cavity which has several radiating carinæ; the corners of the triangle raised and recurved; the antennæ and palpi black. Thorax coarsely rugose, having a mixture of transverse sculpturing and large shallow punctures; wings fusco-hyaline, with the nervures black, a slight fuscous cloud in the first discoidal cell; the posterior margin of the prothorax narrowly pale testaceous; the posterior coxæ transversely rugose-striate; the posterior femora incrassate, denticulate beneath. Abdomen: the first segment transversely striated, the following smooth and shining; the ovipositor a little shorter than the body.

*Male.* About the same size as the female, similarly coloured and sculptured; the posterior femora similarly denticulate; the first segment of the abdomen more finely striated, the apical margins of the third and three following segments notched in the middle.

*Hab.* Sarawak.

### Gen. MACROGASTER, *Brullé*.

1. MACROGASTER FLAVO-PICTUS. *M. nigro flavoque varius, alis anticis macula magna nigro-fusca ad apicem.*

*Female.* Length 15 lines. Head black; the face, cheeks, mandibles, and scape in front, yellow. Thorax black, transversely rugose; the posterior margin of the prothorax, a small and a large spot beneath the wings, the legs and breast in front, four spots on the mesothorax, a spot on the scutellum and a smaller one at each side, the tegulæ, and the base and sides of the metathorax, yellow; the wings hyaline; the nervures black; the stigma yellow; a large dark fuscous macula at the apex of the marginal cell extending across the second submarginal cell. Abdomen black and subopaque, with the apical margins of the segments smooth and shining; each segment with a yellow fascia before its apical margin, the two basal fasciæ widest in the middle, the four following narrowest in the middle, or the two last slightly interrupted; the ovipositor twice the length of the insect.

*Hab.* Singapore.

This species may possibly be a *Rhyssa* with the petiolated submarginal cell obsolete; the neurulation of the wing agrees with that of Brullé's genus *Macrogaster*. I am not acquainted with any other genus to which it could belong; the antennæ are those of *Rhyssa*, not apparently of *Macrogaster*.

### Gen. OPHION, *Fabr.*

1. OPHION IRIDIPENNIS. *O. rufo-ferrugineus, capite postico flavo, abdomine fusco basi ferrugineo, metathorace rugoso.*

*Female.* Length 10 lines. Reddish-yellow; the eyes distinctly emarginate; the face smooth and shining, slightly convex; the tips of the mandibles black; the head yellow behind. Thorax: the mesothorax smooth and shining, with a central longitudinal fuscous stripe; the metathorax coarsely transversely rugose, with a series of short longi-

tudinal striæ at the base; wings hyaline and splendidly iridescent, the nervures ferruginous, with the costal nervure and stigma much darker. Abdomen fuscous, with the first, second, and base of the third segments ferruginous.

*Hab.* Borneo (Sarawak).

2. *OPHION VESTIGATOR*. *O.* rufo-testaceus, abdomine apice fusco, metathorace subrugoso.

*Female*. Length 10 lines. Pale rufo-testaceous: eyes deeply emarginate; wings hyaline and iridescent, the nervures fusco-ferruginous; the meso- and metathorax rugose; the four apical segments of the abdomen fuscous and covered with short cinereous pubescence.

*Hab.* Malacca.

#### Gen. *XYLONOMUS*, *Grav.*

1. *XYLONOMUS FULGIDIPENNIS*. *X.* opacus, niger, antennis flavo-annulatis, alis nigris aureo-fulgentibus, abdomine nigro-chalybeo.

*Female*. Length 14 lines. Black and opaque: antennæ annulated with yellow; the thorax narrowed anteriorly; the metathorax large and wide; the wings dark brown, with a bright coppery effulgence; the tegulæ and two spots at the base of the metathorax obscurely blue. Abdomen blue-black, with bright tints of blue in certain lights.

*Hab.* Sarawak.

I have assigned this fine insect to the genus *Xylonomus*, to which it appears to belong; the neuration of the wings and the enlarged metathorax connect it with that genus.

#### Fam. *BRACONIDÆ*, *Westw.*

##### Gen. *BRACON*, *Fabr.*

1. *BRACON ACULEATOR*, *Fabr.* *B.* ferrugineus, antennis aculeoque nigris, alis flavescentibus, puncto marginali nigro.

*Ichneumon aculeator*, *Fabr. Ent. Syst. ii.* 159. 105.

*Bracon aculeator*, *Fabr. Syst. Piez.* 107. 21.

*Hab.* Malacca (Mount Ophir). Borneo (Sarawak). Tranquebar.

2. *BRACON QUADRICEPS*. *B.* capite thorace pedibus anticis et intermediis coxisque posticis ferrugineis, pedibus posticis et abdomine nigris, alis fuscis basi hyalinis.

*Female*. Length  $7\frac{1}{2}$  lines. Head, thorax, anterior and intermediate legs, and the posterior coxæ, ferruginous; the head and thorax smooth and shining, the former quadrate; the clypeus deeply emarginate; the scape and first joint of the flagellum ferruginous within; the wings yellow to the apex of the externo-medial cell, beyond which they are fuscous and mottled with a number of semitransparent spots; the base of the stigma reddish-yellow. Abdomen and posterior legs black; the first segment of the abdomen at an oblique angle with the following segments, above, with a central and two lateral carinæ, outside of which it is yellow; the second and third segments longitudi-

nally rugose-striate; the following segments smooth and shining; the ovipositor ferruginous, the sheaths black and very pubescent.

*Hab.* Borneo (Sarawak).

This species, which has the posterior tarsi thickened and the abdomen angulated at the base, I have little doubt belongs to the genus *Myosoma* of Brullé.

3. *BRACON SUSPICIOSUS*. *B. capite thorace pedibus anticis et intermediis sanguineo-rubris, alis fuscis, abdomine nigro.*

*Female.* Length 8 lines, of the ovipositor 9 lines. Black: the head, scape of the antennæ, anterior legs, pro- and mesothorax, ferruginous; the head subquadrate, very smooth and shining; the clypeus emarginate its entire width, the tips of the mandibles black. The thorax highly polished above; the wings dark fuscous, with a semi-hyaline streak crossing the lower angle of the first submarginal cell; the posterior tibiæ and tarsi stout. The first segment of the abdomen at right angles with the following segments; the second and third segments longitudinally striated, the following segments smooth and shining.

*Hab.* Borneo (Sarawak).

This species in all probability belongs to Brullé's genus *Myosoma*.

4. *BRACON INSIGNIS*. *B. capite thorace pedibus anticis et intermediis ferrugineis, metathorace supra nigro, abdomine pedibusque posticis nigris, alis nigro-fuscis, ovipositore corpore quadruplo longiore.*

*Female.* Length of the body 11 lines, of the ovipositor 44 lines. Head, thorax, anterior and intermediate legs ferruginous; the head and thorax smooth and shining, the antennæ black; the metathorax, posterior legs, and abdomen, black, wings dark fuscous; beneath the first submarginal cell is a minute hyaline spot. Abdomen: the basal segment, and a triangular impressed shape at the base of the second in the middle, longitudinally striated; the second, third, and fourth segments with a rugose striation, radiating from the middle of each segment; the apical segments smooth and shining; the ovipositor ferruginous, the sheaths black and pubescent.

*Hab.* Borneo (Sarawak).

5. *BRACON CEPHALOTES*. *B. rufescenti-flavus, antennis et ovipositore nigris, alis flavo-hyalinis, macula nigra ad stigmatis basin, alteraque in cellula prima discoidali.*

*Female.* Length 8 lines. Rufo-flavous; antennæ and tips of the mandibles black; anterior margin of the clypeus entire; head wider than the thorax, quadrate, smooth, and shining. Thorax very smooth, shining; the mesothorax very convex anteriorly, with an oblique depression on each side anteriorly; the wings flavo-hyaline, with a black macula at the base of the stigma, and a smaller one at its apex, a third macula in the first discoidal cell, and an oblong stain beyond it on the margin of the wing; the posterior wings with their apex and inferior margin fuscous; the posterior tarsi slightly fuscous. Abdo-

men smooth and shining, the basal segment with a deep fovea anteriorly, and a convex shape beyond extending to the posterior margin; the two following segments with an oblique depression on each side.

*Hab.* Borneo (Sarawak).

This species resembles the *B. aculeata*, Fabr., but differs in not having the thorax narrowed anteriorly, and in having an additional spot on the wings; the head is also much larger, and in what I consider to be *B. aculeata*, the two basal joints of the antennæ are pale ferruginous.

6. *BRACON PERPLEXUS*. *B. flavus*, vertice macula triangulari notato, antennis tarsisque posticis et ovipositore nigris, alis fuscis, dimidio basali flavis.

*Female*. Length 6 lines. Yellow: the vertex with a large triangular shape, which extends to the insertion of the antennæ, the tips of the mandibles and the antennæ, black; the head smooth and shining; the thorax smooth and shining, with the posterior tarsi dusky; wings yellow-hyaline as far as the apex of the externo-medial cell, beyond which they are of a uniform black, not intense in colour, and with an oblong hyaline streak in the first submarginal cell and two ovate ones below; the stigma yellow at the base. Abdomen: the first segment with a central longitudinal convex shape in the middle, which, as well as the two following segments, is longitudinally striated; the ovipositor black.

*Hab.* Borneo (Sarawak).

7. *BRACON VAGATUS*. *B. capite thorace pedibusque anticis et intermediis ferrugineis, abdomine maculaque metathoracis nigris, alis flavescentibus.*

*Female*. Length 5 lines. Head, thorax and legs, smooth, shining, ferruginous, the antennæ black, a fuscous spot on the vertex. Thorax smooth and shining; the metathorax black above, and the posterior legs black; the wings flavo-hyaline; a black spot at each end of the stigma; the apex of the posterior wings and the apical portion of the inferior margin of the superior pair, slightly fuscous. Abdomen: the lateral and apical margins of the basal segment, and the apical margins of the third and following segments, yellow; the basal segment with a longitudinal deep lateral channel and a central carina; the second segment rugose, with the apical margin and three triangular spaces at the base, smooth, shining, black; the third segment with an oblique deeply impressed line on each side, the ovipositor black.

*Hab.* Malacca (Mount Ophir).

8. *BRACON INQUIETUS*. *B. capite thorace pedibusque anticis et intermediis ferrugineis, abdomine alis maculaque metathoracis nigris.*

*Female*. Length 9 lines. Head, thorax, anterior and intermediate legs, ferruginous; the face with a triangular flattened projecting appendage at the base of the clypeus; the antennæ black, the head quadrate, smooth and shining. Thorax smooth and shining, with a black spot on the metathorax above; the wings and posterior legs black. Ab-



domen finely rugose, the basal segment with two deeply impressed smooth longitudinal channels, the lateral margins yellow, beneath yellow; the ovipositor with its sheaths very pubescent.

*Hab.* Sarawak.

This species probably belongs to the genus *Myosoma* of Brullé.

9. *BRACON RUGIFRONS*. *B. niger*, capite thorace pedibusque anticis et intermediis ferrugineis, alis nigris.

*Female*. Length 5 lines. Black: head, thorax, anterior and intermediate legs ferruginous, the scape ferruginous; the thorax and the vertex smooth and shining, the face rugose; the head subquadrate; the thorax much narrowed towards the head; the mesothorax with two longitudinal smooth elongate impressed lines converging towards the scutellum; the wings of a uniform dark fuscous. Abdomen: the three basal segments longitudinally and irregularly striated; the basal segment margined laterally and having a central carina, the second segment with a central and two converging carinae; the third segment with a deep transverse depression, the apical margin smooth and shining; the fourth segment irregularly depressed and striated at the base.

*Hab.* Borneo (Sarawak).

10. *BRACON FLORALIS*. *B. niger*, capite thorace pedibusque anticis ferrugineis, antennis pedibusque intermediis et posterioribus, alis et abdomine maculaque metathoracis nigris.

*Female*. Length  $6\frac{1}{2}$  lines. Head, scape of the antennae, thorax, anterior and intermediate legs, ferruginous; the head and thorax very smooth and shining; the thorax narrowed anteriorly into a neck; the mesothorax with two elongate converging smooth impressed lines; the metathorax dark rufo-piceous above, with a bright ferruginous line down the centre; the intermediate tibiae and tarsi black; wings dark brown, with a hyaline spot at the inferior angle of the first submarginal cell. Abdomen smooth and shining; the first segment with a deeply impressed channel on each side, and a central impressed line extending from the base half way towards the apex; the second segment with a spear-shaped elevation in the middle of its base, and a lateral deep longitudinal excavation at the sides; the third segment with an oblique impressed line at the sides.

*Hab.* Borneo (Sarawak).

11. *BRACON VULTUOSUS*. *B. capite thorace pedibusque anticis ferrugineis*, abdomine pedibusque intermediis et posticis, abdomine maculaque metathoracis nigris.

*Female*. Length 7 lines. Black: head, thorax and anterior legs, the scape and basal joints of the flagellum, in front, ferruginous; the face with a projecting flattened appendage at the base of the clypeus; the scape fringed with black hairs on its inner margin. Thorax smooth and shining; the metathorax obscure, black in the middle and

rufo-piceous at the sides, above ; wings fuscous, palest towards their apex, with the stigma yellow ; the intermediate legs with the knees ferruginous. Abdomen opaque, finely rugose ; the basal segment with a longitudinal striation, a deeply impressed space at the sides, with the extreme lateral margins, yellow ; the second segment with a small arrow-headed raised shape in the middle of its base and an oblique impressed line on each side ; the two following segments have also oblique impressed lines at the sides ; the third and fourth segments with their apical margins straight in the middle and abruptly oblique at the sides.

*Hab.* Singapore.

12. *BRACON FOVEATUS*. *B. capite thorace pedibusque anticis ferrugineis, alis nigris, ovipositoreque elongato pubescentibus.*

*Female.* Length 7 lines. Black : head, thorax, scape in front and the anterior legs, ferruginous ; the face punctured, the thorax smooth and shining ; the mesothorax with two converging longitudinal depressions extending to the scutellum ; the wings dark fuscous ; the intermediate tibiæ at their apex in front obscurely ferruginous. Abdomen : the four basal segments longitudinally rugose ; the basal segment with a longitudinal smooth shining depression on each side ; the second segment with two triangular smooth depressions and a longitudinal one on each side running onwards and terminating in a large fovea ; the third and fourth segments with a smooth shining fovea on each side, the fifth and sixth segments smooth and shining ; the ovipositor more than twice the length of the insect, and very pubescent.

*Hab.* Singapore.

13. *BRACON LABORIOSUS*. *B. capite thoraceque flavo-variegatis, pedibus anterioribus et intermediis flavis, abdomine annulis flavo-marginatis.*

*Female.* Length 7 lines. Black : the face, mandibles and cheeks, of a reddish-yellow ; a black triangular spot in the middle of the face. Thorax shining, much narrower towards the head ; a line before the tegulæ uniting with a large spot beneath the wings, a transverse space between the posterior wings, the metathorax above, the tegulæ and legs, yellow ; a transverse black patch at the base of the metathorax with a line running backwards from each extremity ; the posterior legs black with the knees yellow ; the wings yellowish-hyaline, the nervures pale ferruginous, the apex of the wing slightly fuscous, a black spot at the base of the first submarginal cell, the stigma pale ferruginous. Abdomen : the basal segment yellow, with a shining black spot in the middle ; the apical margins of the four following segments yellow ; the abdomen yellow beneath, with an elongate black line on each side of the segments.

*Hab.* Borneo (Sarawak).

14. *BRACON CRASSIPES*. *B. capite thorace pedibusque antice ferrugineis,*

metathorace supra nigro-piceo, abdomine pedibusque intermediis et posticis nigris, alis hyalinis basi fuscis.

*Female.* Length 8 lines. Head smooth and shining; antennæ and tips of the mandibles black; clypeus deeply emarginate. Thorax: much narrowed towards the head, smooth and shining; the wings subhyaline, the posterior pair fuscous towards the base, the superior pair yellowish, the nervures pale ferruginous, the costal nervures dark ferruginous, the stigma pale; the legs thick, particularly the posterior pair, the intermediate tibiæ ferruginous at the base. Abdomen: the basal segment at right angles with the following segments; the base of the second segment with an impressed oblique line on each side, and a central carina, each extending to about the middle of the segment; all the segments of an opaque black, and margined posteriorly; the margin of the second segment curved and strongly crenulated, the abdomen yellow beneath.

*Hab.* Singapore.

Gen. AGATHIS, *Latr.*

1. *Agathis flavipennis*, *Brullé*, *Hym.* iv. p. 484. 3.

*Hab.* Singapore. India.

Gen. MICRODUS, *Esenbeck.*

1. *MICRODUS APICALIS.* *M.* capite thorace pedibusque anticis et intermediis pallide ferrugineis, abdomine pedibusque posticis, mesothorace trimaculati et metathorace supra nigris, alis flavescentibus apice fuscis.

*Female.* Length  $5\frac{1}{2}$  lines. Head and thorax pale red; the antennæ, a spot enclosing the ocelli and the eyes, black. Thorax: the mesothorax divided into three elevations by two oblique converging deeply impressed lines, each division with a black stripe in the middle; wings yellow, fuscous beyond the apex of the stigma, the fuscous cloud inclining inwards and crossing both wings. Abdomen: the three basal segments longitudinally striated; their lateral margins and the apical margin of the basal segment, yellow; the abdomen yellow beneath. The ovipositor about the length of the insect.

*Hab.* Singapore.

Fam. CHALCIDIDÆ, *Walker.*

Gen. EPISTENIA, *Westwood.*

1. *EPISTENIA IMPERIALIS.* *E.* capite thoraceque purpureis rude punctatis, alis hyalinis, abdomine versicolori, segmentis apicalibus basi testaceis.

*Female.* Length  $7\frac{1}{2}$  lines. Head and thorax of a rich purple, the metathorax with tints of bright green; the legs black, the apex of the joints rufo-piceous as well as the apical joints of the tarsi. Abdomen: of

changeable hues, partaking of tints of blue, purple, violet or green, in different lights; the three basal segments deeply emarginate above, with central longitudinal depressions extending to their base; the ovipositor thick and pubescent, two-thirds of the length of the abdomen.

*Hab.* Borneo (Sarawak).

This beautiful insect appears to belong to the genus *Epistenia*, established by Westwood in Griffith's 'Animal Kingdom;' if not so, it is very closely allied.

Fam. CHRYSIDIDÆ, *Leach.*

Gen. HEDYCHRUM, *Latr.*

1. HEDYCHRUM ORIENTALE. *H. viridi-cyaneum*, capite thoraceque confertissime punctulatis, abdominis segmenti tertii margine apicali arcuato integerrimo, alis subhyalinis.

Length  $2\frac{1}{2}$  lines. The head and thorax very coarsely punctured, the abdomen more delicately so; the abdomen of a bright green, with blue tints in different lights, the flagellum fusco-testaceous, the mandibles ferruginous at their apex; the deep concavity of the face, in which the scape rests in repose, delicately transversely striate; the tooth at the lateral angles of the metathorax acute; the abdomen nigro-æneous beneath, with a thin, short, glittering pale pubescence, the apical segment widely emarginate.

*Hab.* Singapore.

Gen. CHRYSIS, *Linn.*

2. CHRYSIS MALACHITICA. *C. crassissime punctata viridi-cyanea*, thorace viridi-aureo, alis fusco-hyalinis, abdominis segmentis apicalibus dentibus sex armatis.

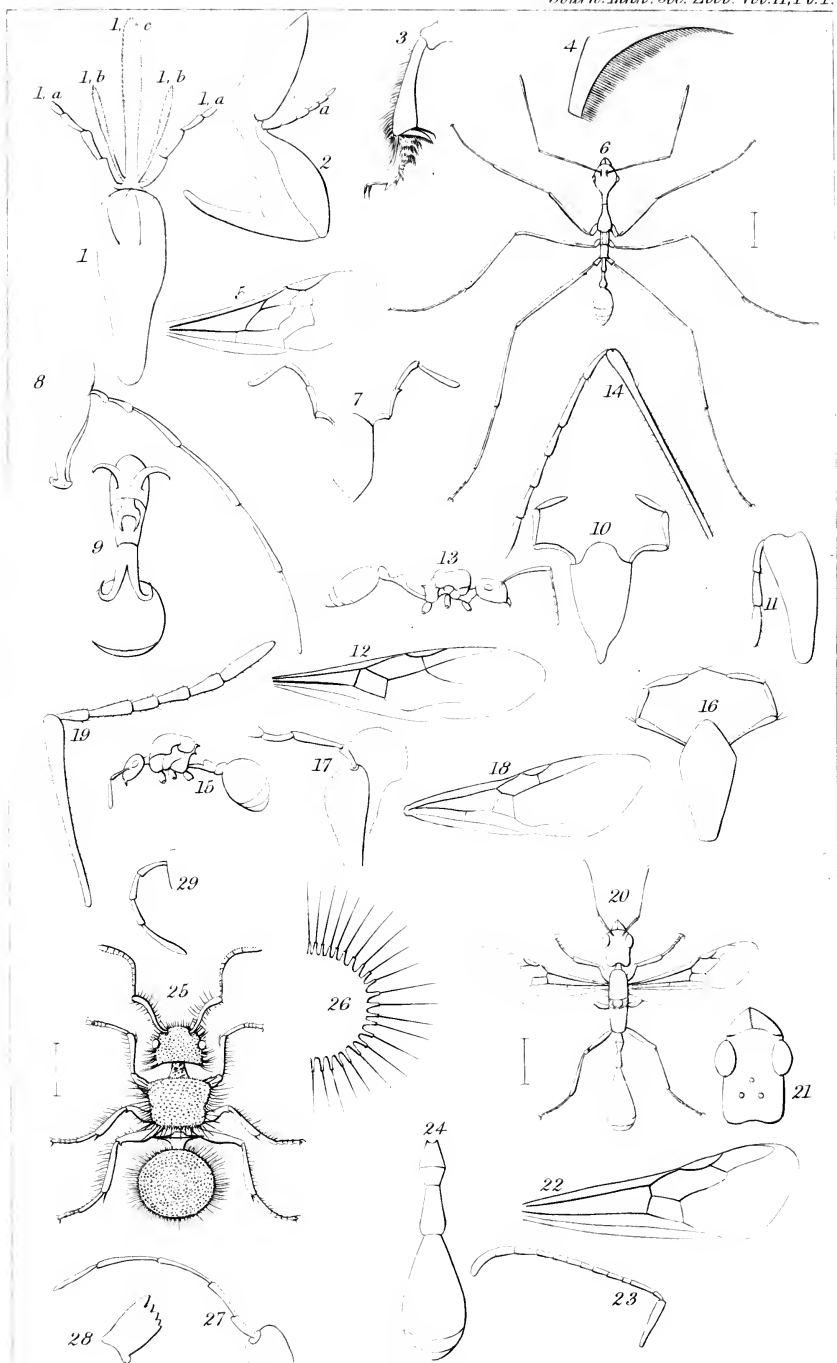
Length  $4\frac{1}{2}$  lines. Metallic green, splashed with gold on the thorax and sides of the abdomen; the flagellum, mandibles, and tarsi black; the hinder margin of the vertex tinged with blue. The disk of the thorax blue; the tegulæ and nervures of the wings with a purple tinge; the wings subhyaline and iridescent; the lateral posterior angles of the metathorax acute; the post-scutellum produced, the apex truncate. Abdomen: more finely punctured than the head and thorax, but most strongly so at the base; the basal margin with a deep excavation on each side, the lateral angles somewhat produced and obtuse; the basal margin of the second segment blue; the apical margin of the third segment armed with six acute teeth.

*Hab.* Borneo (Sarawak).

3. CHRYSIS VESTIGATOR. *C. viridis nitens purpureo variegata*, punctatissima, abdominis segmentis margine basali nigro-æneis, ano tridenticulato.

Length  $3\frac{1}{2}$  lines. Green, with shades and spots of deep blue; the tarsi, flagellum and mandibles, black; the head and thorax coarsely and





deeply punctured, the abdomen more finely so; one or two of the basal joints of the flagellum green above; the region of the ocelli blue. Thorax: a transverse blue line in the middle of the prothorax; the mesothorax with an oblong-quadrangle blue shape in the middle; the wings subhyaline with the nervures brown. The abdomen with a central longitudinal smooth line; the middle of the abdomen tinged with rich blue; the apex distinctly tridentate.

The valuable collection of *Hymenoptera* which I have described, and, by permission of the Society, have had the pleasure of laying before them, is the property of W. W. Saunders, Esq., Fellow of the Society, and is the most complete collection formed by Mr. Wallace. In addition to the interest attached to the description of new species, I have endeavoured to show the extent of the known geographical range of those already described. Of the family *Apidae*, forty-one species are enumerated, twenty-six of which are new. It is, however, to the *Formicidæ* that the most valuable additions are made: of the eighty-five species collected, only seven have been previously described; ten are added to the *Mutillidæ*, forty-one to the Fossorial group, and thirteen to the family *Vespidæ*. This enumeration will serve to give some idea of the valuable additions to science, resulting from the labours of Mr. Wallace, in collecting the insects of the Eastern Archipelago.

#### DESCRIPTION OF THE PLATES.

##### TAB. I.

Fig.

1. Tongue of *Ptenoplectra chalybea*. 1 a, labial palpi; 1 b, paraglossæ; 1 c, labium.
2. The maxilla of *Ptenoplectra chalybea*. 2 a, maxillary palpus.
3. The posterior leg of *Ptenoplectra*.
4. Calcar or spur on the posterior tibia of *Ptenoplectra*.
5. Anterior wing of *Ptenoplectra*.
6. *Myrmica longipes*, ♂.
7. The labial palpi of *Polyrhachis*.
8. Maxillary palpi of *Polyrhachis*.
9. Thorax and abdomen of *Polyrhachis bihamata*.
10. Labial palpi of *Heptacondylus*. 11. Maxillary palpi of the same.
12. Wing of the same. 13. Profile of the same. 14. Antennæ of the same.
15. Profile of *Physatta*. 16. Labial palpi of the same. 17. Maxillary palpi of the same. 18. Wing of the same. 19. Antennæ of the same.

Fig.

20. *Cerapachys oculatus*. 21. Head of the same. 22. Wing of the same.  
23. Antennæ of the same. 24. Abdomen of the same.  
25. *Echinopla melanarctos*. 26. Section of the abdomen of the same,  
showing the styles, or blunt spines, with hairs on their summits,  
which cover the abdomen above. 27. Maxillary palpus of the same.  
28. Mandible of the same. 29. Labial palpus of the same.

#### TAB. II.

1. *Myrmosida paradoxa*. 1 *a*, antennæ; 1 *b*, wing.
2. *Crematogaster inflata*. 1 *b*, wing; 1 *c*, manble.
3. *Cataulacus horridus*.
4. *Cataulacus insularis*. 4 *a*, anterior wing.
5. *Meranoplus cordatus*. 6. *Meranoplus mucronatus*.
7. *Meranoplus castaneus*. 8. *Cataulacus reticulatus*.
9. Tongue of *Gayella pulchella*. 9 *a*, labial palpi; 9 *b*, paraglossæ. 10.  
Maxilla. 10 *a*, maxillary palpi.
11. Anterior wing of *Gayella pulchella*.

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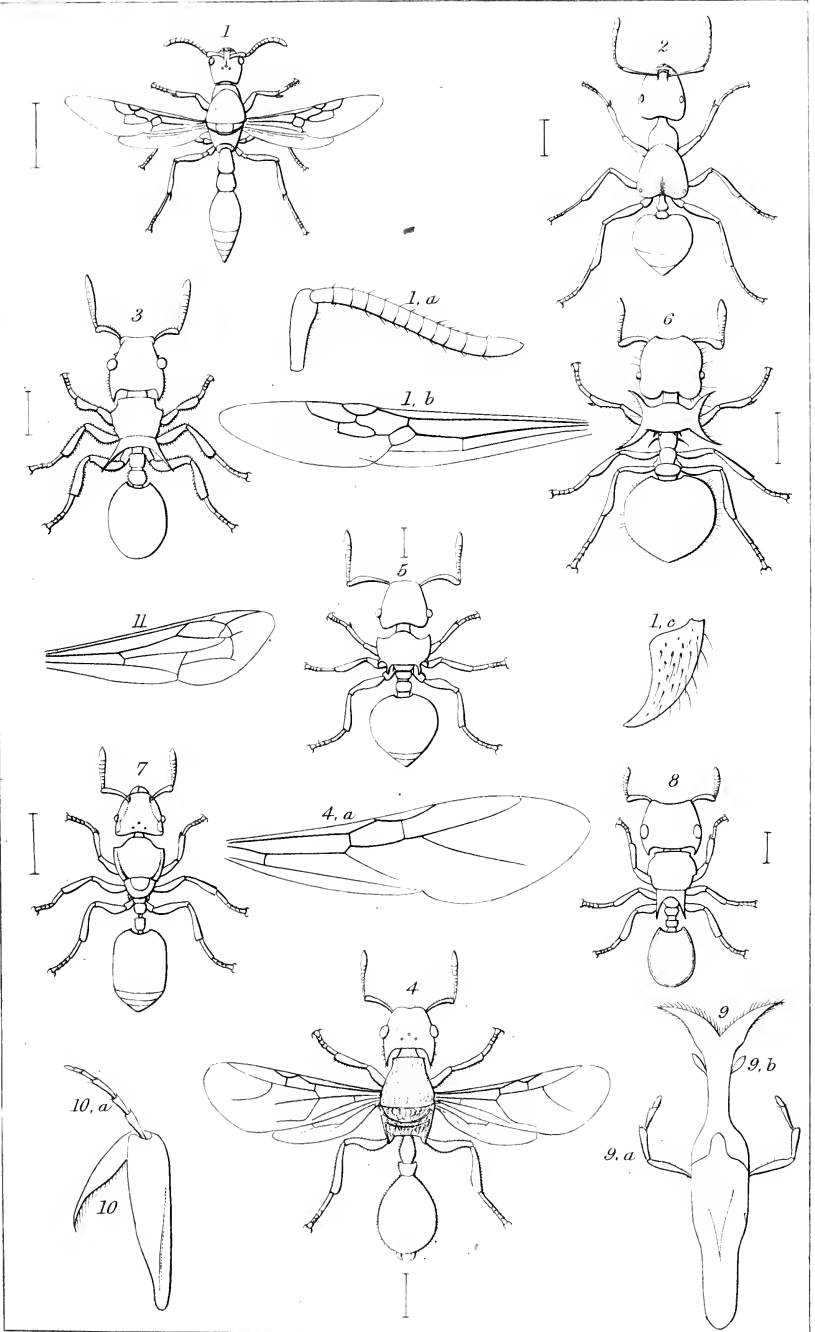
On the general Geographical Distribution of the Members of the  
Class AVES. By PHILIP LUTLEY SCLATER, Esq., M.A.,  
F.L.S.

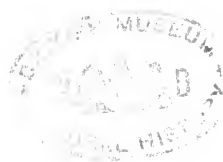
[Read June 16th, 1857.]

AN important problem in Natural History, and one that has hitherto been too little agitated, is that of ascertaining the most natural primary divisions of the earth's surface, taking the amount of similarity or dissimilarity of organized life solely as our guide. It is a well-known and universally acknowledged fact that we can choose two portions of the globe of which the respective Faunæ and Floræ shall be so different, that we should not be far wrong in supposing them to have been the result of distinct creations. Assuming then that there are, or may be, more areas of creation than one, the question naturally arises, how many of them are there, and what are their respective extents and boundaries, or in other words, what are the most natural primary ontological divisions of the earth's surface?

In the Physical Atlases lately published, which have deservedly attracted no small share of attention on the part of the public, too little regard appears to have been paid to the fact that the divisions of the earth's surface usually employed are not always those







which are most natural when their respective Faunæ and Floræ are taken into consideration. The world is mapped out into so many portions, according to latitude and longitude, and an attempt is made to give the principal distinguishing characteristics of the Fauna and Flora of each of these divisions; but little or no attention is given to the fact that two or more of these geographical divisions may have much closer relations to each other than to any third, and, due regard being paid to the general aspect of their Zoology and Botany, only form one natural province or kingdom (as it may perhaps be termed), equivalent in value to that third. Thus in 'Johnston's Physical Atlas,' the earth is separated into sixteen provinces for Ornithology, solely according to latitude and longitude, and not after ascertainment of the amount of difference of ornithic life in the respective divisions. Six of these provinces are appropriated to America, one to Europe, and six to Asia, Australia, and the islands; a very erroneous division, according to my ideas, as I shall hereafter attempt to show. In Mr. Swainson's article in Murray's 'Encyclopedia of Geography,' and in Agassiz's introduction to Nott and Gliddon's 'Types of Mankind,' what I consider to be a much more philosophical view of this subject is taken. The latter author, in particular, attempts to show that the principal divisions of the earth's surface, taking zoology for our guide, correspond in number and extent with the areas occupied by what Messrs. Nott and Gliddon consider to be the principal varieties of mankind. The argument to be deduced from this theory, if it could be satisfactorily established, would of course be very adverse to the idea of the original unity of the human race, which is still strongly supported by many Ethnologists in this country. But I suppose few philosophical zoologists, who have paid attention to the general laws of the distribution of organic life, would now-a-days deny that, as a general rule, every species of animal must have been created within and over the geographic area which it now occupies. Such being the case, if it can be shown that the areas occupied by the primary varieties of mankind correspond with the primary zoological provinces of the globe, it would be an inevitable deduction, that these varieties of Man had their origin in the different parts of the world where they are now found, and the awkward necessity of supposing the introduction of the red man into America by Behring's Straits, and of colonizing Polynesia by stray pairs of Malays floating over the water like cocoa-nuts, and all similar hypotheses, would be avoided.

But the fact is, we require a far more extended knowledge

of zoology and botany than we as yet possess, before it can be told with certainty what *are* the primary ontological divisions of the globe. We want far more correct information concerning the families, genera, and species of created beings—their exact localities, and the geographical areas over which they extend—before very satisfactory conclusions can be arrived at on this point. In fact, not only families, genera, and species, but even local varieties must be fully worked out in order to accomplish the perfect solution of the problem. There is no reason, however, why attempts should not be made to solve the question, even from our present imperfect data, and I think the most likely way to make good progress in this direction, is for each inquirer to take up the subject with which he is best acquainted, and to work out what he conceives to be the most natural divisions of the earth's surface from that alone. Such being done, we shall see how far the results correspond, and on combining the whole, may possibly arrive at a correct solution of the problem—to find the *primary ontological divisions of the earth's surface*.

With these views, taking only the second group of the Order Vertebrata, the Class *Aves*, I shall attempt to point out what I consider to be the most natural division of the earth's surface into primary kingdoms or provinces, looking only to the geographical distribution of the families, genera, and species of this class of beings.

Birds, being of all the animated creation the class most particularly adapted for wide and rapid locomotion, would, at first sight, seem to be by no means a favourable part of Nature's subjects for the solution of such a problem. But, in fact, we know that there are many species, genera, and even families of this class, particularly amongst the *Passeres*, whose distribution is extremely local. The *Nestor productus*, confined to the little island called Philip Island; the several genera of Finches peculiar to the archipelago of the Galapagos; the gorgeous family *Paradiseidæ*, restricted to the Papuan territory, are familiar examples of this fact. Again, the migratory birds which traverse large districts of the earth's surface, how constant are they in returning only where they have been in former years! We do not find that the Nightingale extends its range farther to the west one year than another, nor that birds looked upon as occasional visitors to this country, grow more or less frequent. If the contrary be the case, it may always be accounted for by some external cause, generally referable to the agency of *man*, and not to any change in Na-

ture's unvarying laws of distribution. It is, however, amongst the *Passeres* that we find *endemism* most normal; the *Accipitres*, *Anseres*, and, more than all, the *Grallæ* are ever disposed to be *sporadic*, and indeed some species belonging to the latter order may be denominated truly cosmopolitan.

Taking then the birds of the order *Passeres* (which I consider ought properly to include the *Scansores* or *Zygodactyli*) as the chief materials from which to derive our deductions, let us suppose a species of this group, but of doubtful form and obscure plumage, to be placed before the Ornithologist, from whom its name is required. The first thing he looks to is, whether it is from the Old World or the New; and this is a point which, as a general rule, a mere glance at the external appearance of the object is sufficient to settle. The most obvious geographical division of the birds of this order certainly corresponds with the usually adopted primary division of the earth's surface. In fact, taking Ornithology as our guide, we may at once pronounce that the Faunæ of the Old and New worlds may, to all appearance, have been the subjects of different acts of creation. There are very many natural families which are quite peculiar to one or the other of these great divisions of the earth's surface, more subfamilies, few genera really common to the two, and very few, if any, species\*.

The appended Table will show some of the most noticeable of the natural families of birds which are confined to the Old and New worlds respectively.

Familiæ Neogeanæ, sive Novi Orbis.		Familiæ Palæogeanæ, sive Orbis Veteris.	
Todidæ.	Tyrannidæ.	Coraciidæ.	Promeropidæ.
Momotidæ.	Cotingidæ.	Eurylæmidæ.	Muscicapidæ.
Bucconidæ.	Rhamphastidæ.	Meropidæ.	Musophagidæ.
Galbulidæ.	Opisthocomidæ.	Upupidæ.	Coliidæ.
Trochilidæ.	Cracidæ.	Bucerotidæ.	Megapodidæ.
Icteridæ.	Tinamidæ.	Sturnidæ.	Pteroclidæ.
Cærebidæ.	Meleagrînæ.	Paradiseidæ.	Phasianidæ.
Formicariidæ.	Odontophorinæ.	Meliphagidæ.	Perdicinæ.
Dendrocolaptidæ.			

With regard to the genera of *Passeres*, common to the two worlds, when we have excepted the truly cosmopolitan forms *Turdus*, *Hirundo*, *Picus*, &c., the number will be found very small; and it will be observed that these are invariably genera

\* There are now acknowledged only 8 species of the order *Passeres*, in

belonging to temperate regions, and such as extend themselves only through the northern portion of the New World, failing entirely before we reach Tropical and Southern America, the most really characteristic region of Neogean Ornithology.

Such is the case in the genera *Sitta*, *Certhia*, *Regulus*, *Parus*, *Lanius*, *Perisoreus*, *Pica*, *Corvus* and *Loxia*. No member of these genera (which are common to the temperate portions of both hemispheres) extends farther south in the New World than the Table-land of Mexico. They are all quite foreign to Neotropical (Tropical American) Ornithology, although in the Old World most of them reach the tropics.

Having, therefore, made our first territorial division that of the two worlds, agreeing so far with geographers, we will look at the great continent and Australia *en masse*, and see what are its most natural subdivisions.

Here we find ourselves at once at issue with ordinary geographers. Europe may be a very good continent of itself, in many ways, and in some respects worth all the rest of the world put together,—“*Better fifty years of Europe than a cycle of Cathay*,” says the Poet,—but it is certainly *not* entitled to rank as one of the primary zoological regions of the earth’s surface, any more than as one of the physical divisions. Europe and Northern Asia are in fact quite inseparable. So far as we are acquainted with the ornithology of Japan—the eastern extremity of the temperate portion of the great continent, we there find no striking differences from the European *Avi-fauna*, but rather repetitions of our best-known European birds in slightly altered plumage,—representatives in fact of the European types. Temminck, indeed, has stated, that there are no less than 114 birds found in Japan, identical with European species. Some of these, however, have been since ascertained to be apparently distinct, but there can be no question as to the general strong resemblance of the Japanese *Avi-fauna* to that of Europe. How far south we are to extend the boundaries of this great temperate region of the Old World can

which no differences have, as yet, been detected in the comparison of specimens from the Old and New worlds, viz.:—

Cotyle riparia.	Linota linaria.
Ampelis garrula.	Plectrophanes nivalis.
Junco hyemalis.	Plectrophanes lapponica.
Linota borealis.	Loxia leucoptera.

The whole of these (with exception of *Cotyle riparia*) range to the extreme north, where the two worlds almost unite.

hardly be fairly ascertained, until the ornithology of Central Asia is much better worked out than is at present the case. While among the birds of the Himalayas we find many striking instances of the recurrence of European types, there is no doubt that the ornithology of the Indian Peninsula and the rest of Southern Asia, below the 30th parallel, is quite different from it.

Africa, north of the Atlas, along the southern shores of the Mediterranean, again appears to belong to Europe zoologically, and not to the continent to which it is physically joined. Such species of birds, foreign to Europe, as are found in Algeria and Morocco, are not usually connected with true African forms, but are again slightly modified representatives of Europæo-Asiatic species.

Such are the N. African species.

*Garrulus cervicalis.*

*Pica mauritanica.*

*Fringilla spodiogenia.*

*Parus ultramarinus.*

*Picus numidicus.*

Representatives of the European.

*Garrulus cristatus.*

*Pica caudata.*

*Fringilla cælebs.*

*Parus cæruleus.*

*Picus major.*

On the whole, therefore, I think we may consider Africa, north of the Atlas, Europe and Northern Asia, to form one primary zoological division of the earth's surface, for which the name Palæarctic or Northern Palæogean Region would be best applicable.

The great continent of Africa will form a second well-marked division, after cutting off the slice north of the Atlas, but including Madagascar (where the African type appears to have reached the height of its peculiar development) and Western Arabia, to the Persian Gulf; for in this latter region, so far as our information goes, the African type seems to predominate over the Indian. Although there are genera of *Passeres* common to Africa and India, and even a few species, yet there can be no question as to the generally dissimilar character of the *Avi-faunæ* of these two countries. This second African division may be called the Æthiopian or Western Palæotropical Region.

Another tropical region of the Old World seems to be constituted by Southern Asia and the islands of the Indian Archipelago. The Philippines, Borneo, Java, and Sumatra, certainly belong to this division, but it is of course not yet possible to decide where the line runs which divides the *Indian* zoology from the Australian. New Guinea presents probably only a more exaggerated produc-

tion of the Australian type, and I should be inclined for the present not to separate New Zealand and the Pacific Islands generally from the Australian division. We should have, therefore, in the Old World one temperate region and three tropical; the eastern palæotropical or Australian advancing rather farther to the south than the others, the Indian or middle palæotropical being the most northern of the three.

In the New World we can simply divide the continent into northern and southern divisions; the northern, or Nearctic region, extending down the centre of the table-land of Mexico, and showing some indication of parallelism to the Palæarctic by the presence of certain temperate types; the Neotropical or southern (which embraces the whole of the rest of this great continent) being wholly free from any admixture of the sort, and in fact exhibiting, in my opinion (with the exception possibly of New Guinea), by far the richest and most peculiar *Avi-fauna* of the world's surface.

Having thus pointed out what I consider to be the primary divisions of the earth,—taking ornithology as our guide, I propose to devote a few lines to each region separately, noticing its apparent limits, its peculiarities, and most characteristic forms, and attempting to give an approximate estimate of the comparative abundance of ornithic species within its area.

The subjoined plan will serve to give at one view an illustration of my ideas as to the arrangement of these primary *Avi-faunæ* of the earth's surface. It must, however, be recollected that the calculations made as to the number of species to a square mile, can be only looked upon as mere attempts at approximations. Even in the whole general calculation, the presence of two variable elements—in the first place the number of square miles (about which geographers still give the most conflicting statements), and in the second place, the number of species of birds, concerning which ornithologists are as yet by no means agreed, greatly increases the uncertainty of the ratio deducible from them; and in working out the ratios in the respective regions, it is of course still more difficult to attain to any great degree of accuracy.

Taking however the whole number of square miles of dry land at 45,000,000, and the number of species of birds at 7500, which are both of them moderate estimates, we have on the average a single species to each 6000 square miles. In the different regions we shall attempt to show how far this ratio is departed from.

The zoological kingdoms or primary divisions are of course naturally separable into secondary divisions or provinces, but it would



be extending the limits of this communication too far to attempt to go into these at the present time.

### I. PALÆARCTIC REGION (*Regio Palæarctica*).

*Extent*.—Africa north of the Atlas, Europe, Asia Minor, Persia and Asia generally north of the Himalaya range, upper part of the Himalaya range?, northern China, Japan and the Aleutian Islands. Approximate area of 14,000,000 square miles.

*Characteristic forms*.—*Sylvia*, *Luscinia*, *Erythacus*, *Accentor*, *Regulus*, *Podoces*, *Fregilus*, *Garrulus*, *Emberiza*, *Coccothraustes*, *Tetrao*.

It cannot be denied that the ornithology of the Palæarctic or great temperate region of the Old World is more easily characterized by what it has not than by what it has. There are certainly few among the groups of birds occurring in this Region, which do not develop themselves to a greater extent elsewhere. For we must acknowledge that the most productive seats of animal life, where all the bizarre and extraordinary forms that the Naturalist best loves are met with, lie under the suns of the tropics, and far removed from temperate latitudes. The most prevalent forms among the *Passeres*, of the Palæarctic Region, are perhaps the plain dull-coloured *Sylviinæ*, distinguished rather for their melodious song than by any external beauty of plumage or singularity of form. Upwards of 35 species of this subfamily occur in the ornithology of Europe alone; and when Northern Africa and the whole North of Asia are taken into calculation, the number would be considerably increased, and this Region may be considered the true focus of the group.

The genus *Erythacus* would be perhaps as good a representative genus as any as a type of Palæarctic ornithology; a second species (*Erythacus akahige*) occurring at the eastern extremity of the Asiatic continent, and there beautifully representing our common Robin. True *Emberiza* is likewise very characteristic of the temperate portion of the Old World, nearly the whole of the known species being found in Europe or Northern Asia. *Accentor* is perhaps more strictly a northern Himalayan form, with several representatives within the Palæarctic Region; but *Fregilus*, *Podoces*, *Garrulus*, *Tetrao*, and numerous species of *Anatidæ* are likewise eminently noticeable as among the most typical forms of Palæarctic ornithology.

The most recent summary of the Birds of Europe gives—

1. Accipitres.....	57	} 581 species.
2. Passeres .....	238	
3. Scansores.....	12	
4. Columbæ .....	7	
5. Gallinæ.....	22	
6. Struthionæ ....	0	
7. Grallæ .....	101	
8. Anseres.....	144	

It is very difficult to say what additions should be made to this in order to give the approximate number of the birds of the whole Palæarctic Region; but a moderate calculation does not show more than 650 species truly belonging to this fauna: for it must be recollected that the number 581 contains many birds of rare occurrence in Europe, and which must be correctly reckoned as belonging to other divisions. As we have in the Palæarctic Region the enormous land area of probably upwards of 14,000,000 square miles, this will give us a species for each 21,000 square miles, speaking in round numbers; and it consequently follows (as might have been expected), that the Palæarctic is by far the least prolific region of ornithic life on the globe. According to my ideas, therefore, the statement in Johnston's 'Physical Atlas,' that "*Europe possesses more species than any other zoological province,*" is exactly contrary to the fact.

## II. ÆTHIOPIAN OR WESTERN PALÆOTROPICAL REGION (*Regio Æthiopica*).

*Extent*.—Africa, south of the Atlas range, Madagascar, Bourbon, Mauritius, Socotra and probably Arabia up to the Persian Gulf, south of 30° N. l.; an approximate area of 12,000,000 square miles.

*Characteristic forms*.—*Gypogeranus*, *Helotarsus*, *Polyboroides*, *Gypohierax*, *Melierax*, *Macrodipteryx*, *Irrisor*, *Fregilupus*, *Bucorvus*, *Apaloderma*, *Parisoma*, *Macronyx*, *Lioptilus*, *Sericolius*, *Malaconotus*, *Laniarius*, *Chaunonotus*, *Prionops*, *Sigmodus*, *Phyllastrephus*, *Lanioturdus*, *Vidua*, *Juida*, *Buphaga*, *Verreauxia*, *Læmodon*, *Indicator*, *Musophaga*, *Colius*, *Pæocephalus*, *Numida*, *Phasidus*, *Struthio*, *Balæniceps*, *Scopus*.

(Madagascar). *Euryceros*, *Falculia*, *Oriolia*, *Philippitta*, *Brachypteracias*, *Atelornis*, *Bernieria*, *Hartlaubius*, *Artamia*, *Vanga*, *Coua*, *Leptosomus*, *Vigorsia*, *Mesites*, *Biensis*.

The characteristic forms of African Ornithology are very nume-

rous. Several groups of birds, which seem clearly entitled to rank as distinct families, or at least as subfamilies, are wholly peculiar to this region, such as the *Coliidae*, *Musophagidae*, and *Buphaginæ*. There are also very many genera, of which the species are all confined to this continent; the principal of which I have enumerated in my List of Typical forms. The island of Madagascar, however, is the locality where the African type seems pushed to its utmost degree of development. There are many genera quite peculiar to this island, or which have a single representative or so upon the adjacent coast of the continent. Such are *Oriolia*, *Atelornis*, *Brachypteracias*, *Vanga*, and others which I have mentioned above, not to mention the extinct gigantic *Æpyornis*. Bourbon, Mauritius and the other Mascarene islands all belong to Africa zoologically, and have only recently lost the now extinct birds of the genera *Didus*, *Pezophaps* and their allies, which were, so far as we know, types quite peculiar to this locality.

Dr. G. Hartlaub's lately published *System der Ornithologie West-Africa's* gives as inhabitants of that part of the continent,—

Accipitres .....	56	} 753.
Passeres .....	450	
Scansores .....	69	
Columbæ .....	17	
Gallinæ .....	19	
Struthiones .....	1	
Grallæ .....	99	
Anseres .....	42	

In the preface to Dr. Hartlaub's work will be found a *resumé* of all the most important facts known concerning African Ornithology.

For North-eastern Africa we have a List lately published by Dr. Heuglin, who mentions—

1. Accipitres.....	95	} 754 species.
2. Passeres .....	372	
3. Scansores.....	38	
4. Columbæ.....	14	
5. Gallinæ .....	24	
6. Struthiones ....	1	
7. Grallæ .....	130	
8. Anseres .....	80	

A correct catalogue of the Birds of S. Africa would probably be not less numerous in species.

On the whole, therefore, I think we cannot allow for the Western Palæotropic region less than 1250 species, which, with an area of 12,000,000 square miles, gives one species to each 9600 square miles nearly.

### III. INDIAN OR MIDDLE PALÆOTROPICAL REGION (*Regio Indica*).

*Extent*.—India and Asia generally south of Himalayas, Ceylon, Burmah, Malacca and Southern China, Philippines, Borneo, Java, Sumatra and adjacent islands; an area of perhaps 4,000,000 square miles.

*Characteristic forms*.—*Harpactes*, *Colocalia*, *Calyptomena*, *Eurylæmus*, *Buceros*, *Garrulax*, *Liothrix*, *Malacocercus*, *Pitta*, *Timalia*, *Pycnonotus*, *Phyllornis*, *Pericrocotus*, *Analcipus*, *Acridotheres*, *Gracula*, *Sasia*, *Megalæma*, *Phœnicophaus*, *Dasylophus*, *Palæornis*, *Pavo*, *Cerionnis*, *Polyplectron*, *Argus*, *Euplocamus*, *Rollulus*, *Casuaris*.

Mr. Swainson, in his article in H. Murray's 'Encyclopedia of Geography,' considers the mainland of Southern Asia and the larger Indian islands as belonging to two different zoological regions. But it is now generally acknowledged that this is not the case. There are so many generic forms which commence in Southern Asia and extend over the greater part of the Indian Archipelago, that it is not possible to look upon these countries as belonging to different regions, though they doubtless form distinct subkingdoms or provinces, in each of which will be found corresponding representative species. How far in an eastern direction we are to extend the boundaries of the Middle Palæotropical Region is a difficult question, which can hardly be answered until we know more of the Natural History of these great islands; but there is no doubt that Borneo, Sumatra and Java belong to this zoology, but probably not Celebes.

The most characteristic forms of the Indian region are without doubt the *Phasianidæ*, the whole of which magnificent group of birds may be said to be confined to this region,—one or two species only straying into the confines of Palæarctic zoology, and a single genus, *Meleagris*, representing them in America, and the few birds of the genera *Numida*, *Agelastus* and *Phasidus* in Africa.

If the number of species duly attributable to the Middle Palæo-

tropical Region, be reckoned at about 1500, and its geographical area at nearly 4,000,000 square miles, we have a species to each 2600 miles nearly, which indicates a degree of intensity of species only surpassed by Tropical America.

#### IV. AUSTRALIAN OR WESTERN PALÆOTROPICAL REGION (*Regio Australiana*).

*Extent*.—Papua and adjacent islands, Australia, Tasmania and Pacific Islands ; an area of perhaps 3,000,000 square miles.

##### *Characteristic forms*.—

1. (Australia.) *Ægotheles*, *Falcunculus*, *Colluricincla*, *Grallina*, *Gymnorhina*, *Strepera*, *Cinclosoma*, *Menura*, *Psophodes*, *Malurus*, *Sericornis*, *Epthianura*, *Pardalotus*, *Chlamydera*, *Ptilonorhynchus*, *Struthidea*, *Licmetis*, *Calyptorhynchus*, *Platycercus*, *Euphema*, *Calopsitta*, *Climacteris*, *Scythrops*, *Myzantha*, *Talegalla*, *Leipoa*, *Pedionomus*, *Dromaius*, *Cladorhynchus*, *Tribonyx*, *Cereopsis*, *Anseranas*, *Biziura*.

2. (Papua.) *Sericulus*, *Melanopyrrhus*, *Ptiladela*, *Edoliosoma*, *Peltops*, *Rectes*, *Manucodia*, *Gymnocorvus*, *Astrapia*, *Paradisea*, *Epimachus*, *Nasiterna*, *Charmosyna*, *Cyclopsitta*, *Goura*, &c.

3. (New Zealand.) *Neomorpha*, *Prothemadera*, *Anthornis*, *Acanthisitta*, *Mohoa*, *Certhiparus*, *Turnagra*, *Aplonis*, *Creadion*, *Nestor*, *Strigops*, *Apteryx*, *Ocydromus*.

4. (Pacific Islands.) *Moho*, *Hemignathus*, *Drepanis*, *Pomarea*, *Metabolus*, *Sturnoides*, *Leptornis*, *Tatara*, *Loxops*, *Coriphilus*, *Ptilonopus*.

New Guinea is in some respects so peculiar in its Ornithology, as far as we are acquainted with it, that it would at first sight appear as if it ought to form a zoological region of itself. But there are certainly many genera common to it and Australia (for example, *Podargus*, *Tanysiptera*, *Alcyone*, *Mimeta*, *Ptilorhis*, *Cracticus*, *Manucodia*, &c.); and for the present I am inclined to retain it as part of the Australian region. Both New Zealand and the Pacific islands have also some claims to stand alone as separate regions, their forms of ornithic life being in many cases extremely peculiar and local. If they can be attached anywhere, however, it is to Australia; and I have included them temporarily in the same region. Mr. Gould's 'Birds of Australia' has made us

well acquainted with the ornithology of that continent; but there still remains New Guinea and the multitudinous adjacent islands, which doubtless contain numbers of species as yet unknown to science. Mr. Gould, in his 'Birds of Australia,' enumerates—

1. Accipitres.....	36	} 600.
2. Passeres .....	311	
3. Scansores.....	36	
4. Columbæ ....	23	
5. Gallinæ.....	16	
6. Struthiones ....	1	
7. Grallæ .....	78	
8. Anseres .....	99	

in all 600 species.

The most characteristic forms of this region are perhaps the *Paradiseidæ* and *Epimachidæ* (both peculiar to it); the *Meliphagidæ*, one or two genera only of which are found externally, and of which between 60 and 70 species occur in Australia alone; the genera *Calyptorhynchus*, *Microglossa*, *Trichoglossus*, *Platycercus*, *Nestor*, *Strigops*, and many other forms amongst the *Psittacidæ*, besides a vast number of others.

Taking 3,000,000 of square miles as the amount of dry land in this region, and allowing 1000 species as peculiar to it, we have one species to every 3000 square miles, showing us that this is little inferior to the middle Palæotropical Region in intensity of species.

## V. NEARCTIC OR NORTH-AMERICAN REGION (*Regio Nearctica*).

*Extent*.—Greenland and North America down to centre of Mexico—area of perhaps 6,500,000 square miles.

*Characteristic forms*.—*Trochilus*, *Sialia*, *Toxostoma*, *Icteria*, *Vireo*, *Mniotiltinæ*, *Chamæa*, *Certhia*, *Sitta*, *Neocorys*, *Calamospiza*, *Zonotrichia*, *Picicorvus*, *Gymnocitta*, *Meleagris*.

As is the case in the Old World, most of the genera belonging to the northern part of the New World are better represented in its tropical than in its temperate portions. Northern America, however, produces *Sylvicolæ* and *Zonotrichiæ* in much greater abundance than southern America, and these genera (which are analogous to the *Sylviniæ* and *Emberizæ* of the Old World) are perhaps its most ordinary characteristic forms. I have already

mentioned the chief genera common to the northern portions of both hemispheres. These are also characteristic of *Nearctic* in contrast to Neotropical zoology, as none of them extend into Southern America. The ornithology of the U. S. of America (which now embrace a very large proportion of the Nearctic region) contains upwards of 620 species.

Calculating the area of the Nearctic Region at six millions and a half of square miles, and the species peculiar to it at 660, we have about 9000 miles for each species, making this region, as might have been supposed, the least productive of ornithic life, after the Palæarctic.

## VI. NEOTROPICAL OR SOUTH-AMERICAN REGION (*Regio Neotropica*).

*Extent*.—West India Islands, Southern Mexico, Central America and whole of S. America, Galapagos Islands, Falkland Islands. Estimated area of about 5,500,000 square miles.

*Characteristic forms*.—1. (Continental.) *Sarcorhamphus*, *Ibycter*, *Milvago*, *Thrasaetus*, *Cymindis*, *Herpetotheres*, *Steatornis*, *Nyctibius*, *Hydropsalis*, *Eleothreptus*, *Trogon*, *Bucco*, *Monasa*, *Galbula*, *Furnarius*, *Synallaxis*, *Anabates*, *Oxyrhamphus*, *Dendrocolaptes*, *Pteroptochos*, *Rhamphocœnus*, *Campylorhynchus*, *Hylophilus*, *Lessonia*, *Agriornis*, *Formicarius*, *Formicivora*, *Grallaria*, *Taniptera*, *Tityra*, *Conopophaga*, *Pipra*, *Rupicola*, *Phœnicercus*, *Cotinga*, *Gymnoderus*, *Cephalopterus*, *Vireolanius*, *Cyclorhis*, *Thamnophilus*, *Tanagra*, *Calliste*, *Saltator*, *Euphonia*, *Catamblyrhynchus*, *Phytotoma*, *Opisthocomus*, *Ramphastos*, *Picumnus*, *Celeus*, *Crotophaga*, *Cultrides*, *Penelope*, *Oreophasis*, *Crax*, *Thinocorus*, *Tinamus*, *Psophia*, *Cariama*, *Eurypyga*, *Parra*, *Palamedea*, *Chauna*, *Aramus*, *Merganetta*, *Heliornis*.

2. (Antilles.) *Todus*, *Priotelus*, *Cinclocerthia*, *Dulus*, *Loxigilla*, *Phœnicophilus*, *Spindalis*, *Glossiptila*, *Teretristis*, *Saurothera*.

3. (Galapagos.) *Certhidea*, *Cactornis*, *Camarhynchus*, *Geospiza*.

There can be no question, I think, that South America is the most peculiar of all the primary regions in the globe as to its ornithology. There are at least eight or nine distinct families of birds which are quite confined to this country, many of these embracing a multitude of different genera and species. The *Trochilidæ* (which are the distinguishing family of the new world *par emphase*) are now known to be more than 320 in number, and

nearly the whole of them belong to tropical America, a few species only ranging into the northern portions of that continent. It is of course quite impossible to ascertain exactly the boundary between the northern and southern zoological regions of the New World; but many of the peculiar forms of the southern division appear to extend some way up the coast-line of Southern Mexico, even north of the isthmus of Tehuantepec; whilst northern forms range down the table-land quite into the Southern States of the Mexican Union. Thus we find one or two representatives of all the most characteristic South American groups occurring to the north of Panama,—*Galbula melanogenia* representing the *Galbulidæ*; *Pipra mentalis* and *Manacus Candæi*, the *Piprinæ*; *Calliste larvata*, the genus *Calliste*; *Cotinga amabilis*, the *Cotingæ*, and so on.

The Antilles seem to be a kind of debateable ground between the two regions, but are more properly referable, I suppose, or at least the greater portion of them, to the southern region. They furnish us, however, with several peculiar genera which do not occur elsewhere.

The Neotropical Region is without doubt, I think, rich in number of species beyond any other. A calculation which I made some short time ago of species occurring southwards of Panama gave me—

1. Accipitres .....	95	} 2000 species;
2. Passeres .....	1360	
3. Scansores .....	230	
4. Columbæ .....	25	
5. Gallinæ .....	80	
6. Struthiones .....	2	
7. Grallæ .....	128	
8. Anseres .....	80	

and I am decidedly of opinion that, what with taking recent additions into consideration and adding on Central America, we cannot estimate the number of birds belonging to this region at less than 2250. Taking the approximate area at  $5\frac{1}{2}$  millions of square miles, this will give a species to each 2400 square miles. It follows, therefore, that this region is more richly endowed with ornithic species than any other portion of the globe.



SCHEMA AVIUM DISTRIBUTIONIS GEOGRAPHICÆ.

CREATIO NEOGEANA

Sive Orbis novi. } =  $\frac{1}{4,000}$ .  
12,000,000 square miles, }  
3,000 species, }

ORBIS TERRARUM.

45,000,000 square miles, } =  $\frac{1}{6,000}$ .  
7,500 species, }

CREATIO PALÆOGEANA

Sive Orbis antiqui. } =  $\frac{1}{7,300}$ .  
33,000,000 square miles, }  
4,500 species, }

V.

Regio Nearctica

Sive Boreali-Americana.  
6,500,000 square miles,  
660 species,  
1  
=  $\frac{1}{9,000}$ .

VI.

Regio Neotropica

Sive Meridionali-Americana.  
5,500,000 square miles,  
2,250 species,  
1  
=  $\frac{1}{2,400}$ .

I.

Regio Palæarctica

Sive Palæogeana Borealis.  
14,000,000 square miles,  
650 species,  
1  
=  $\frac{1}{21,000}$ .

II.

Regio Æthiopica

Sive Palæotropica Hesperica.  
12,000,000 square miles,  
1,250 species,  
1  
=  $\frac{1}{9,600}$ .

III.

Regio Indica

Sive Palæotropica Media.  
4,000,000 square miles,  
1,500 species,  
1  
=  $\frac{1}{2,600}$ .

IV.

Regio Australiana

Sive Palæotropica Eoa.  
3,000,000 square miles,  
1,000 species,  
1  
=  $\frac{1}{3,000}$ .

Regio I. .... 620 species.

II. .... 1,200  
" ..... 1,760  
III. .... 1,000  
IV. .... 570  
V. .... 2,350  
VI. ....

Total ..... 7,500

Note on the Occurrence of *Phyllosoma commune* on the Coast of Cornwall. By JONATHAN COUCH, F.L.S. &c.

[Read November 5, 1857.]

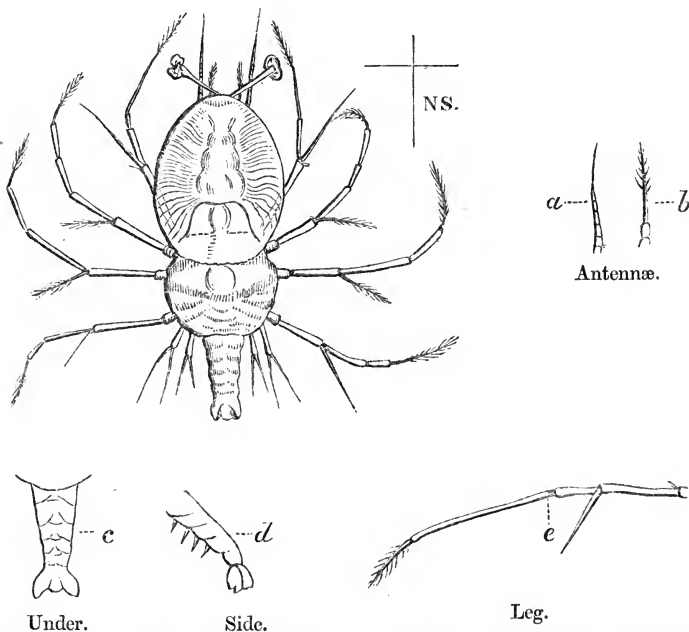
I HAVE the pleasure of communicating to the Linnean Society a notice of the occurrence of the *Phyllosoma commune* on the coast of Cornwall; and although, from an announcement in the Report of the Royal Cornwall Polytechnic Society for the year 1851, it appears that it has been taken once before in our waters, yet as no further remark is made concerning it by W. Cocks, Esq., who had noticed it, and no description or figure is to be found in our President's 'History of British Stalk-eyed Crustacea,' it is hoped that a representation of this creature, drawn from a British specimen, with such observations as I was able to make from an example newly taken, will be acceptable to the Society.

The specimen was captured near Polperro, in a pilchard drift-net, four leagues from land, at a depth of about three fathoms from the surface, on the 1st August, 1857. It attracted the particular notice of the fisherman from the sparkling brilliancy of its eyes, while the rest of its body was almost as transparent as glass. When brought on shore a few hours afterwards, it was able to exert some moderate degree of activity. It came into my possession about twenty-four hours after its death, and its immersion in a bottle of glycerine, the best fluid I am acquainted with for ensuring the preservation of many small subjects of natural history, which it effects without changing anything of their colour, and but little of their transparency.

This example is a little less than an inch in length, and of the form and proportions represented in the figure which accompanies this paper; but the sketch I have made is enlarged, that I might more readily represent the disposition of the parts. The body is very thin, or depressed; the border of the carapace egg-shaped, being broadest a little behind the middle of the length. The head is represented as distinct from the carapace (thorax, M. E.); but the separation is scarcely discernible. The eyes on long and slender footstalks, which are inserted together at one point, are erected divergently: the upper part of the eyestalk is enlarged, and the eye itself formed of two unequal portions; the anterior of which is the larger. The principal [external] antennæ wide apart, projecting beyond the eyes, with 3 joints, the lowest furnished with a fine spine. The internal antennæ [antennules] appearing between the footstalks of the eyes and the external antennæ, and

shorter than both; divided near the tip, and the (slightly) longer branch having a scarcely perceptible brush. Both pairs of antennæ are directed straight forward; but when alive, it is probable that, together with the eyes, they possess extensive motion.

The second or posterior carapace, called by Dr. Milne Edwards the thorax, is less than the former, but equally thin and transparent, and near its border carries the coxæ, or insertion of the proper legs. Posteriorly it has attached to it the abdomen, terminating in two long, bifid processes. I count 4 rings on the abdominal portion, and there are probably 5; under these are 4 oval plates, perhaps in pairs. Lateral plates of the tail, oval; the central less distinct and not quite so long: legs long, slender, four pair, bifurcate at the second joint; the posterior bifurcation scarcely longer than the second phalanx; the first and last pair having this part rather longer than the two intermediate ones. All of them (the principal branches and bifurcations) simple, pointed, clothed with hairs toward the end.



*Phyllosoma commune*, taken near Polperro, August 1, 1857, in a pilehard drift-net, four leagues from land and three fathoms from the surface.

The eyes are the only parts that can be said to possess colour,

the globe of the eye and a small part of the stalk supporting it being of a rich brown; but those who saw the animal alive informed me, that on the sides of the carapace were patches of the colour of silver, which, however, had vanished when it came to my hands.

At first nothing could be discerned of its interior organization, beyond some slight lines, which appeared to be nerves or blood-vessels, and which proceeded from the upper border of the thorax to the antennæ or eyes. But as the glycerine penetrated into its substance, the structure became visible without being obscure. Proceeding from the narrow longitudinal line, the whole breadth of the carapace presented an organization which I could not doubt was branchial. The organ on either side appeared to arise with 11 roots: the shortest, which were in front, were simple; but the greater number were bifurcate, and some had no less than four divisions, 22 in all. The four pairs of legs are inserted into the border of the thorax, and at the place of insertion the margin appears to possess a little angularity, and lines of greater density are seen passing off from the coxæ towards a place of meeting in the middle. Those I suppose to be muscles.

[MEMORANDUM.]

The species of *Phyllosoma* represented in the figure accompanying Mr. Couch's paper, appears to differ in one respect from the form described by M. Edwards under that name, in which the cephalic tergal plate is stated to be *less* than the thoracic. The diversity, however, may be due to difference of age or sex; and it is to be remarked, that Mr. Couch's figure corresponds very closely in this and other respects with that of *Phyllosoma commune* (Leach) given in Tuckey's 'Voyage to the River Zaire,' p. 417, Pl. 18. fig. 6.

The very recent researches of Dr. Gegenbaur (Siebold and Köl liker's Zeitsch. f. Wiss. Zoolog. Band v. p. 352; and Müller's Archiv, 1858, p. 43) have thrown much light upon the internal organization of *Phyllosoma*. From these it would appear to be placed beyond doubt, that the organs supposed by Mr. Couch to be internal *branchiæ*, are in reality, as suggested by M. M. Edwards (Hist. Nat. des Crustacées, t. ii. p. 475), the liver, and that the respiratory function is performed chiefly by the expanded external surface of the body, although special organs analogous to *branchiæ* exist in the form of feathered appendages to the feet.

For the detailed information concerning the nervous, circulatory and alimentary systems in *Phyllosoma*, reference should be made

to the latter of the two papers cited above. And it need here only, be remarked that in the condition of the circulatory system, this remarkable genus would appear to differ widely from the Stomapod type and very closely to resemble the Decapoda.—[G. B.]

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On the Zoology of New Guinea.

By PHILIP LUTLEY SCLATER, M.A., F.L.S. &c.

[Received December 3, 1857. Read December 17, 1857.]

IN pointing out what appear to me to be the principal zoological divisions of the earth's surface (as I attempted to do in the course of the observations on the general geographical distribution of birds which I made before the Linnean Society last summer), it was not without some hesitation that I placed New Guinea in the same region as Australia. Since that time I have paid some attention to what is known of the zoology of this interesting country, and have had an opportunity of revisiting the museums of Paris and Leyden, where the best series of its animals are to be found. From what I have thus observed, and from the writings of the Dutch naturalists on the subject, I am now quite persuaded that, while Borneo, Java and Sumatra are inseparably allied to the South-Asiatic fauna, Amboyna, Timor, Gilolo, New Guinea and probably Celebes, with some of the other Eastern islands, are properly appertinent to the same primary zoological region as Australia. The straits of Macassar are perhaps the determining line separating these two regions, the island of Lombok (which lies due south of them) being (as Mr. Wallace's investigations have shown) in some respects debateable ground between them.

With the view of supplying materials towards a more perfect understanding of the distribution of organized life in these countries, I have drawn up the following summary of the mammalia and birds of New Guinea, as far as the scattered and scanty notices on this subject met with among the writings of different travellers and naturalists have enabled me to do so.

The first explorer of New Guinea who has left us any record of his scientific proceedings is Sonnerat, who during his celebrated voyage in the year 1771 collected a considerable number of plants and birds, principally on the island of Jobie in the Bay of Geelvink, of which he afterwards gave an account in his '*Voyage à la Nouvelle Guinée*,' published in Paris in 1776. Some of the species

figured by Sonnerat were provided with scientific names by Scopoli in the second part of his '*Deliciæ Faunæ et Floræ Insubricæ*' (fol. Ticini, 1786); and these authors are therefore our earliest authorities on Papuan ornithology.

In 1818 MM. Quoy and Gaimard, in the French discovery-ship '*Uranie*,' visited Guebé, Waigiou and Rawak, and in the "Zoology" of their voyage described three or four species of birds from these islands, but do not appear to have brought anything from the main coast of New Guinea.

The next era in the scientific exploration of this country is one of considerable importance. From the 26th of July to the 9th of August, 1824, the French discovery-ship '*Coquille*,' remained at anchor in a harbour in the north-eastern part of the Bay of Geelvink, named by the French "*Havre-Dorey*." The well-known naturalist Lesson was attached to this expedition, as also M. Garnot. During their twelve days' stay they procured, amongst other objects of natural history, about fifty species of birds, the greater part of which were quite new to science and were afterwards described by them in their joint work upon the zoology of the expedition. M. Lesson's other works, his '*Traité*' and '*Manuel d'Ornithologie*,' and '*Histoire des Paradisiens*,' &c., likewise contain many interesting notices arising from observations made during his sojourn on this spot.

Three years afterwards, in 1827, a second French discovery-ship, the *Astrolabe*, under the command of Dumont d'Urville, passed another twelve days in the same place. MM. Quoy and Gaimard, who were again the naturalists of this expedition, obtained, on this occasion, twelve additional novelties in ornithology, which they afterwards described and figured in the '*Zoology of the Voyage of the Astrolabe*.'

The next event to be recorded in the scientific history of Papua sprang from the energy of a different people. A few months after this, in the beginning of 1828, the Government of Holland sent the corvette '*Triton*' and schooner '*Iris*' from Batavia to found a settlement on the west coast of New Guinea. The expedition had on board a royal commissioner and several members of the scientific commission which was then engaged in the exploration of the Dutch possessions in the East Indies. They first explored the Dourga Strait on the southern coast, and thence returning northwards, discovered in the district called Lobo, what they described as a deep and spacious bay shut in by elevated land, and of a picturesque aspect. There they commenced their establish-

ment with the construction of a fort, and took formal possession on the 24th of August, 1828, of the whole coast in the name of the King of the Netherlands, with the usual solemnities. The bay was christened "Triton's Bay," and the strait leading to it, "Iris Strait," to commemorate the names of the two vessels. After several years' occupation, this settlement was eventually abandoned on account of the excessive unhealthiness of the locality; but MM. Müller and Macklot, the two scientific commissioners, were by no means idle during their stay there on the first foundation of the settlement, and it is to their industry that the Leyden Museum is indebted for the finest series of specimens of natural history from this wonderful country which is in existence. It is much to be regretted that no full account has ever been given to the public of these discoveries. In the magnificent work entitled, '*Verhandelingen over de Natuurlijke Geschiedenis der Nederlansche overzeesche bezittingen*,' in which the results of the labours of the scientific commission are reported, it is stated that 119 species of birds were obtained in New Guinea; but no complete catalogue is given of them. In fact, in the zoology of this work only monographs of one or two of the more noticeable genera of birds are contained; others are shortly characterized in the foot-notes attached to the volume which treats of the Ethnography, and is entitled '*Land en Volkenkunde*,' whilst a large remainder have as yet only received MS. names in the Leyden Museum, under which many of them are inserted in Prince Bonaparte's '*Conspectus*,' often even without any attempt at descriptive characters.

The recently published volume on the zoology of the '*Voyage au Pôle Sud*' (the plates of which were issued several years since), contains several novelties in Papuan ornithology, which were met with during the passage of the exploring vessels *Astrolabe* and *Zélée* along the southern and western coasts of New Guinea; and some scattered notices on the same subject also occur in the reports of one or two of the English expeditions.

From all these sources we are acquainted with about 170 species of birds inhabiting New Guinea; a number which, when we consider the large extent of its surface and the very small portion of it which has been scientifically explored, consisting only of two small isolated spots at its western extremity and parts of its southern coasts, we may calculate to represent perhaps not more than one-third of the species it really possesses. Of these species about 109 appear to be peculiar to New Guinea, that is, they have not hitherto been found

elsewhere; 14 are common to New Guinea and Australia; 35 occur in other of the Eastern islands besides New Guinea, and the remainder are birds of wide distribution. The true tendency of this ornithology is perhaps better manifested by the presence of certain genera, such as *Ptilotis*, *Entomophila*, *Tropidorhynchus*, *Mimeta*, *Cracticus*, *Ptilonorhynchus*, and *Geopelia*, which are highly characteristic of the fauna of Australia; and by the occurrence in Northern Australia of members of the Papuan genera *Tanysiptera*, *Manucodia*, *Ptilorhis* and *Microglossa*. On the other hand, the presence of species of *Buceros*, *Arachnothera*, *Eupetes* and *Corvus*, and of *Peltops* (a genus of *Eurylæmidæ*) in New Guinea, types which do not extend into Australia, serve to remind us that New Guinea is somewhat intermediate in the character of its fauna, as in its geographical position, between the Indian and Australian regions. Upwards of 20 generic forms appear, as far as we know, to be quite restricted to Papua and its adjacent islets, namely, *Melidora*, *Xanthomelus*, *Melanopyrrhus*, *Ptiladela*, *Edoliisoma*, *Peltops*, *Rectes*, *Gymnocorvus*, *Paradisea*, *Diphyllodes*, *Cicinnurus*, *Lophorina*, *Parotia*, *Seleucides*, *Epimachus*, *Paradigalla*, *Astrapia*, *Charmosyna*, *Nasiterna* and *Eutrygon*; but the propriety of the generic isolation of some of these types may be questioned by some naturalists. One very peculiar family, the *Paradiseidæ*, is quite confined to New Guinea and its adjacent islets. I have been particular in ascertaining what species of these remarkable birds have been really met with *alive* in the localities visited by naturalists. M. Lesson, it appears, procured *P. rubra* on the island of Waigiou, and *P. Papuana* and *Cicinnurus regius* at Havre-Dorey; MM. Müller and Macklot found at Triton's Bay only the two latter species. M. Lesson likewise met with *P. apoda* in the Aru islands, and Mr. Wallace, who has recently visited these islands, also found *P. apoda* and *Cicinnurus regius* living there. It is much to be hoped that this latter gentleman, who has so successfully commenced his explorations in the Eastern archipelago may carry them to an equally prosperous termination and widely extend our present imperfect knowledge of the zoology of these countries.

Again, New Guinea agrees with Australia in the absence of two families, the Wood-peckers (*Picidæ*) and Pheasants (*Phasianidæ*), both of which are very fully developed in the region of Indian zoology. It is also observable that hitherto no *Fringillidæ* appear to have been met with in New Guinea, although I have little doubt that, when the zoology is more fully explored, forms connected



with *Amadina*, *Poephila* and their allies, which are abundant on the northern coasts of New Holland, will be detected.

Thus far I have spoken only of the Birds of New Guinea, as of the Mammalia there is not much to say, except to call attention to the fact of its close intimacy with Australia in this respect. Out of the ten species of this class of beings hitherto observed in New Guinea, all, with the exception of the *Sus* and the Dugong of the coasts, belong to the *Marsupialia*, an order which is pre-eminently Australian. Of the genera to which these Marsupials are referred, two are peculiar to New Guinea, and one (*Cuscus*) belongs rather to the Moluccas; but the three others are characteristic Australian forms. The tables given in the zoological volume of the 'Verh. over de Nat. Gesch.' present us with a most instructive view of the general geographical distribution of the Mammalia in the great Eastern islands. In Sumatra, Borneo and Java we find the most highly organized *Quadrumanæ*, large Carnivores (*Felis* and *Ursus*), Pachyderms; in Sumatra even a peculiar species of Elephant\*, Rhinoceroses and a multitude of the higher classes of Mammalia. What a contrast to this, when we cast our eye down the columns relating to Celebes, Amboyna, Timor and New Guinea! A single straggling *Cercopithecus* (in Celebes and Timor only) and two other *Quadrumanæ* (in Celebes), a single *Cervus*, an Antelope, a *Viverra* (sole representative of the Carnivora), with two or three *Suidæ*, constitute nearly the whole of the Placental Mammals found in these great islands, with the exception of Bats and Rodents. Here, as in Australia, the two latter Orders are found in company with the Marsupials, an additional piece of evidence to my mind of the correctness of Professor Owen's recent arrangement of these groups at the base of the Placental Mammalia: for the student of the geographical distribution of animals soon learns to appreciate the value of the old maxim "*noscitur a sociis*," quite as applicable in this sense to organized existences generally, as, taken in its usual meaning, to mankind.

The following is what I believe to be a tolerably perfect list of the Mammifers and Birds which have hitherto been positively recognized as having been met with in New Guinea and its adjacent islets. In every case I have added the precise locality in which each has been found, when that is ascertainable, and the authority for such locality. I have likewise generally noted the Museums in which examples of the species are contained, nearly all of

\* *Elephas sumatranus*, Temminck, Coup d'œil sur les poss. Nederl. i. p. 328, et ii. p. 91; Bp. in P. Z. S. 1849, p. 144 (note).

which, thanks to the liberality of the Directors of these institutions, I have had the satisfaction of examining myself.

## MAMMALIA.

1. *Sus papuensis*, Lesson.  
Voy. Coq. Zool. i. p. 171, pl. 8. Havre-Dorey (*Less.*). Mus. Paris.
2. *Halichore australis*, Owen.  
Jukes, Voy. Fly. ii. p. 323; Müll. Verh. Ethn. p. 21. Coasts of New Guinea (*Müll.*). Endeavour St., N. Australia (*Jukes*). Brit. Mus.
3. *Dorcopsis Brunii*, Schreber, sp.  
Müll. Verh. Zool. Mamm. p. 131, p. 21. Mus. Ludg. et Brit.
4. *Dendrolagus ursinus*, Müll.  
Verh. Zool. Mamm. p. 141, pl. 19. Mus. Brit. et Lugd.
5. *Dendrolagus inustus*, Müll.  
Verh. Zool. Mamm. p. 143, pl. 20. Mus. Brit. et Lugd.
6. *Cuscus maculatus*, Desm., sp.  
Voy. Coq. Zool. i. p. 156, pl. 5; Müll. Verh. Ethn. p. 20. Mus. Par. et Brit.
7. *Cuscus chrysorrhous*, Temm.  
*Phalangista chrysorrhous*, Temm. Mon. Mamm. i. p. 12; Waterh. Mamm. i. p. 537. South-eastern coast of N. G. (*Jukes*). Mus. Lugd. et Brit.
8. *Belidea Ariel*, Gould?  
P. Z. S. 1842, p. 11; Mamm. Austr. *Petaurus sciureus*, Müll. Verh. Ethn. p. 20.  
The *Belidea* of New Guinea probably belongs to this North-Australian species, which is different from *B. sciurea* of N. S. Wales; see Waterh. Mamm. i. p. 337. Mus. Lugd. et Brit.
9. *Perameles doreyanus*, Q. & G.  
Voy. Astr. Zool. i. p. 100, pl. 16. Havre-Dorey (Q. & G.). Mus. Paris.
10. *Phascogale melas*, Müll.  
Verh. Ethn. p. 20. Lobo (*Müll.*). Mus. Lugd.

## AVES.

### FALCONIDÆ.

1. *Ichthyaëtus leucogaster*, Gm., sp.  
Gould, B. Austr. i. pl. 3. *Falco blagrus*, Müll. Verh. Ethn. p. 21. Lobo (*Müll.*). Mus. Lugd.
2. *Haliastur leucosternus*, Gould.  
Gould, B. Austr. i. pl. 4. *Haliæetus girrenera*, Less. Voy. Coq. Zool. i. p. 615. Havre-Dorey (*Less.*); Lobo (*Müll.*). Mus. Par. et Lugd.
3. *Astur Novæ Hollandiæ*, Gm., sp.  
Gould, B. Austr. i. pl. 14, 15; Müll. Verh. Ethn. p. 21. Lobo (*Müll.*). Mus. Lugd.

4. *Astur? longicaudus*, Garnot, sp.

*Falco longicauda*, Garnot, Voy. Coq. Zool. i. p. 588. Havre-Dorey (Garn.). Mus. Paris.

## STRIGIDÆ.

5. *Spiloglaux humeralis*, H. & J.

*Athene humeralis*, H. & J., Voy. au P. S. Zool. iii. p. 53; Atlas, pl. 4. fig. 1; Bp. Consp. p. 40. Mus. Par.

6. *Spiloglaux theomacha*, Bp.

Bp. Compt. Rend. xli. p. (Oct. 22nd, 1855).

## CAPRIMULGIDÆ.

7. *Podargus papuensis*, Q. & G.

Voy. Astr. Zool. i. p. 207, pl. 13; Gould, B. Austr. Supp. pt. ii. pl. 7; Müll. Verh. Ethn. p. 21. Havre-Dorey (Q. & G.); P. Marianne's Straits and is. Aidoema (Müll.). Mus. Paris.

8. *Podargus ocellatus*, Q. & G.

Voy. Astr. Zool. i. p. 208, pl. 14. Havre-Dorey (Q. & G.). Mus. Par.

## HIRUNDINIDÆ.

9. *Hirundo frontalis*, Q. & G.

Voy. Astr. i. p. 204, pl. 12, fig. 1. *H. neoxena*, Gould, B. Austr. ii. pl. 13? Havre-Dorey. Mus. Paris.

## CYPSELIDÆ.

10. *Macropteryx mystaceus*, Less., sp.

*Cypselus mystaceus*, Less. Voy. Coq. Zool. i. p. 647, pl. 22. Havre-Dorey. Mus. Paris.

Specimens of this beautiful Swift in the Leyden Museum are from Amboyna.

## CORACIIDÆ.

11. *Coracias papuensis*, Q. & G.

Voy. Astr. Zool. i. p. 220, p. 16. Havre-Dorey. Mus. Paris.

This Roller is commonly identified with *Coracias Temmincki*, Vieill. (Le Vaill. Ois. de Par. Suppl. pl. G.), which is from Celebes. Specimens of the latter bird from that island are in the Leyden Museum, and Mr. Wallace has recently transmitted it from the vicinity of Macassar. The two species must be accurately examined and compared before their identity can be considered unquestionable.

## ALCEDINIDÆ.

12. *Dacelo Gaudichaudi*, Q. & G.

Voy. Uranie, Ois. pl. 25. *Chouchalcyon gaudichaudi*, Less., Tr. d'Orn. i. p. 248; Müll. Verh. Ethn. p. 22. I. Waigiou (Q. & G.); Lobo (Müll.). Mus. Paris., Lugd. et Brit.

13. *Melidora macrorrhina*, Less., sp.

*Dacelo macrorrhinus*, Less. Voy. Coq. Zool. i. p. 692, pl. 31 *bis*, fig. 2.  
*Melidora Euphrosiæ*, Less. Tr. d'Orn. p. 249. Havre-Dorey (Less.).  
 Mus. Par.

14. *Halcyon albicilla*, Less.

Less. Tr. d'Orn. i. p. 247. *H. saurophaga*, Gould, Voy. Sulphur, Zool.  
 p. 39, pl. 19. North coast of N. G. (*Hinds*). Mus. Lugd. et Brit.

15. *Halcyon cinnamomeus*, Sw.

Zool. Ill. ser. i. pl. 67; Less. Voy. Coq. Zool. i. p. 696. Havre-Dorey  
 (Less.). Mus. Lugd.

16. *Halcyon Torotoro*, Less., sp.

*Syma Torotoro*, Less. Voy. Coq. Zool. i. p. 689, pl. 31 *bis*, fig. 1; Müll.  
 Verh. Ethn. p. 22. *Halcyon flavirostris*, Gould, B. Austr. Suppl. pt. i.  
 pl. 7?. Havre-Dorey (Less.); Lobo (Müll.). Mus. Paris. et Lugd.

17. *Tanysiptera Dea*, Linn., sp.

Less. Voy. Coq. Zool. i. p. 697; Müll. Verh. Ethn. p. 22. Havre-  
 Dorey (Less.); Lobo (Müll.). Mus. Paris., Lugd. et Brit.

18. *Alcedo Meningting*, Horsf.

Linn. Trans. xiii. p. 172. *Ceyx Meningting*, Less. Voy. Coq. i. p. 691.  
 Havre-Dorey (Less.).

Specimens of this bird in the Leyden Museum are from Java and Borneo.  
 Lesson's authority for its occurrence in New Guinea is perhaps hardly  
 trustworthy.

19. *Alcyone Lessoni*, Cassin.

Pr. Ac. Sc. Phil. 1850, p. 69. *Ceyx azurea*, Less. Voy. Coq. Zool. i.  
 p. 690. Havre-Dorey (Less.); Lobo (Müll.). Mus. Lugd. et Ac. Phil.

20. *Alcyone solitaria*, Temm., sp.

Pl. Col. 595, fig. 2; Müll. Verh. Ethn. p. 22. Lobo (Müll.).

21. *Alcyone pusilla*, Temm., sp.

Pl. Col. 595, fig. 3; Müll. Verh. Ethn. p. 22; Gould, B. Austr. ii. pl. 26.  
 Lobo (Müll.); North Australia. Mus. Lugd.

## BUCEROTIDÆ.

22. *Buceros ruficollis*, Vieill.

Temm. Pl. Col. 557; Müll. Verh. Zool. Aves, p. 24, et Ethn. p. 22.  
*B. plicatus*, Less. Tr. d'Orn. i. p. 445. Lobo (Müll.); Havre-Dorey (Less.).  
 Mus. Lugd.

According to Müller, this Hornbill is the only one which extends to New  
 Guinea, being also found in Amboyna, Gilolo, Ceram, Rawak and Waigiou.  
 It appears to have been confounded by Lesson with *Buceros plicatus*, a  
 Javan species.

## NECTARINIIDÆ.

23. *Nectarinia Eques*, Less.

Voy. Coq. Zool. i. p. 678. pl. 31, fig. 1; Man. d'Orn. pt. ii. p. 45. Havre-Dorey, and Havre d'Offack, Waigiou (*Less.*).

Specimens of this bird in the Leyden Museum are from Gilolo.

24. *Nectarinia Zenobia*, Less., sp.

*Cinnyris Zenobia*, Less. Voy. Coq. Zool. i. p. 679, pl. 30. fig. 3. *Cinn. clementiæ*, Less. Man. d'Orn. ii. p. 40. Havre-Dorey (*Less.*).

25. *Nectarinia aspasia*, Less., sp.

*Cinn. Aspasia*, Less. Voy. Coq. Zool. i. p. 677, pl. 30. fig. 4; Müll. Verh. Ethn. p. 22, et Zool. Aves, p. 58. Havre-Dorey (*Less.*); Lobo (*Müll.*). Mus. Lugd.

26. *Arachnothera Novæ Guineæ*, Less., sp.

*Cinnyris Novæ Guineæ*, Less. Voy. Coq. Zool. i. p. 678; Müll. Verh. Zool. Aves, p. 70. pl. 11. fig. 3. Havre-Dorey (*Less.*); Lobo (*Müll.*).

27. *Dicæum pectorale*, Müll. & Schl.

Verh. Ethn. p. 162 (note). *D. erythrothorax*, Less. Voy. Coq. pl. 30. fig. 1 ? Lobo (*Müll.*). Mus. Lugd.

28. *Melanocharis nigra*, Less., sp.

*Dicæum nigrum*, Less. Voy. Coq. i. p. 673; Cent. Zool. pl. 27; Müll. Verh. Ethn. p. 162. Havre Dorey (*Less.*); Lobo (*Müll.*). Mus. Lugd.

Müller and Schlegel say this bird is not a *Dicæum*, but a Muscicapine, allied to Boie's genus *Hylocharis* (since changed to *Hyloterpe*). It does not seem to me to be referable to either of these genera, but, as far as external appearances go, to be more nearly akin to *Dicæum* than *Hylo-terpe*. I have therefore used for it the new generic term *Melanocharis* (*μέλας, niger*, et *χάρις, gratia*). There are examples of both sexes in the Leyden Museum.

## MELIPHAGIDÆ.

29. *Ptilotis similis*, Puch.

H. & J. Voy. au P. S. Atlas, pl. 17; Zool. iii. p. 89.

30. *Ptilotis fumata*, Müll. MS.

R. Oetanata, N. G. (*Müll.*). Mus. Lugd.

31. *Ptilotis striolata*, Müll. MS.

R. Oetanata, N. G. (*Müll.*). Mus. Lugd.

32. *Ptilotis auriculata*, Müll. MS.

Lobo (*Müll.*). Mus. Lugd.

I was not aware, when I examined specimens of these three last species in the Leyden Museum, that they were undescribed, expecting to find them in the 'Verhandeligen,' &c., or I should have taken notes of them. It is not without reluctance that I insert them in my List, as I strongly disapprove of the practice of publishing MS. names without descriptions; but

in the present instance it is important to show the prevalence of this Australian generic form in New Guinea.

33. *Entomophila albigularis*, Gould.

B. Austr. iv. pl. 51. Lobo (Müll.). Mus. Lugd.

34. *Tropidorhynchus mitratus*, Müll. M.S.

*T. corniculatus*, Müll. Verh. Ethn. p. 21. West coast of New Guinea, R. Oetanata (Müll.). Mus. Lugd.

This is very likely to be the same species as has been lately figured by Mr. Gould as *T. buceroides*, Suppl. B. Austr. pt. ii. pl. 17, in which case it ought to bear that name.

35. *Tropidorhynchus chrysotis*, Less., sp.

*Philedon chrysotis*, Less. Voy. Coq. Zool. i. p. 645, pl. 21 bis. *Myzantha flaviventer*, Less. Man. d'Orn. ii. p. 67. Havre-Dorey (Less.); R. Oetanata (Müll.). Mus. Lugd.

36. *Tropidorhynchus Novæ Guineæ*, Müll. & Schl.

Verh. Ethn. p. 153. West coast of N. G. (Müll.).

#### TURDIDÆ.

37. *Eupetes Ajax*, Temm.

Pl. Col. 573; Müll. Verh. Ethn. p. 22. Lobo (Müll.). Mus. Lugd.

38. *Eupetes cærulescens*, Temm.

Pl. Col. 574; Müll. Verh. Ethn. p. 22. Lobo (Müll.). Mus. Lugd.

39. *Pitta Novæ Guineæ*, Müll. & Schl.

Verh. Zool. Aves, p. 19. *P. atricapilla*, Q. & G. Voy. Astrôl. i. p. 258, pl. 8. fig. 3. Lobo (Müll.); Havre-Dorey (Less.). Mus. Par.

40. *Pitta Mackloti*, Müll. & Schl.

Verh. Zool. Aves, p. 18; Temm. Pl. Col. 547. Lobo (Müll.). Mus. Par. et Lugd.

41. *Pomatorhinus Isidori*, Less.

Voy. Coq. Zool. i. pl. 29. fig. 2. p. 680. *P. Geoffroyi*, G. R. Gray, Gen. B. i. p. 229; Müll. Verh. Ethn. p. 22. Havre-Dorey (Less.); Lobo (Müll.). Mus. Par. et Lugd.

42. *Brachypteryx murinus*.

*Myiothera murina*, Müll. MS. Lobo (Müll.). Mus. Lugd. *Turdirostris murina*, Bp. Consp. p. 218.

There are specimens of both sexes of this bird in the Leyden Museum, coloured alike. It seems congeneric with *B. capistratus* (*Myiothera capistrata*, Temm., Pl. Col. 185, fig. 1.), and I have therefore placed it in the genus to which that bird appears to belong. The following is a short description of the present species:—

Supra terricolori-brunneus, cauda rufescentiore, capite laterali cineras-

centiore: subtus ochraceo-rufescens, gutture albo, ventre medio albescente: rostri mandibula superiore nigra, inferiore albicante; pedibus pallidis: long. tota 4.5. poll. angl. et dec.

## ORIOLIDÆ.

43. *Mimeta striata*, Q. & G.

*Oriolus striatus*, Q. & G., Voy. Astr. i. p. 195, pl. 9. fig. 2. *Oriolus melanotis*, Müll. M.S. *Mimeta melanotis*, Bp. Consp. p. 346. Havre-Dorey (Q. & G.). New Guinea and Timor. Mus. Lugd.

44. *Mimeta Mulleri*, Bp.

Consp. p. 346. *Oriolus viridissimus*, Temm. MS. Mus. Lugd.

45. *Xanthomelus aureus*, Linn., sp.

*Oriolus aureus*, Linn., Le Vaill. Paradis. pl. 18. *Sericulus aureus*, auct. et Bp. Consp. p. 349. Gen. *Xanthomelus*, Bp. Notes Orn. p. 75. Mus. Paris., Lugd. et Brit.

46. *Melanopyrrhus anais*, Less., sp.

*Sericulus anais*, Less. Rev. Zool. 1839, p. 44. Gen. *Melanopyrrhus*, Bp. Notes Orn. p. 9. *Pastor nigro-cinctus*, Cassin, Pr. Ac. Sc. Phil. 1850, p. 68. Mus. Paris. et Acad. Phil.

## CAMPEPHAGIDÆ.

47. *Artamus papuensis*, Bp.

Consp. p. 344. *Ocypterus leucorhynchus*, Müll. Verh. Ethn. p. 21. R. Oetanata (Müll.). Mus. Lugd.

48. *Graucalus Desgrazii*, Puch.

H. & J. Voy. au P. S. pl. 7, fig. 1; Zool. iii. p. 64. Mus. Paris.

49. *Graucalus melanops*, Lath., sp.?

Müll. Verh. Ethn. p. 190; Gould, B. Austr. ii. pl. 55. West coast of N. G. (Müll.). Mus. Lugd.

There are specimens of a *Graucalus* in the Leyden Museum from New Guinea and Amboyna which are there considered to be the same as this Australian species, but I doubt the correctness of this reference.

50. *Graucalus larvatus*, Müll. & Schl.

*Ceblepyris larvata*, Verh. Ethn. p. 190. Mus. Lugd.

The specimens of this bird in the Leyden Museum are some of them marked "New Guinea," but Müller and Schlegel give Java as the correct habitat.

53. *Graucalus papuensis*, Gm., sp.

*Corvus papuensis*, Gm. S. N. i. p. 371; Müll. Verh. Ethn. p. 191. Lobo (Müll.). Mus. Lugd. et Par.

Also in the Leyden Museum from the Banda Is., Ternate and Celebes.

54. *Ptiladela Boyeri*, Puch.

Voy. au P. S. pl. 9. fig. 3; Zool. iii. p. 68. West coast of N. G. Mus. Paris.

55. *Campephaga schisticeps*, Puch.

*Ceblepyris schisticeps*, Puch. Voy. au P. S.; Zool. iii. p. 70, pl. 10. fig. 1. West coast of N. G. Mus. Par.

56. *Campephaga plumbea*, Müll. & Schl.

*Ceblepyris plumbea*, Müll. & Schl. Verh. Ethn. p. 189. R. Oetanata (Müll.). Mus. Lugd.

57. *Edoliisoma melan*, Müll. & Schl., sp.

*Ceblepyris melas*, Müll. & Schl. Verh. Ethn. p. 189 (♂), et *C. cinna-momea*, ibid. (♀): *E. marescoti*, Puch. Voy. au P. S., Zool. iii. p. 70, pl. 10. fig. 2. West coast of N. G. (H. & J.); Lobo (Puch.). Mus. Par. et Lugd.

58. *Dicrurus megarhynchus*, Q. & G., sp.

*Edolius megarhynchus*, Q. & G., Voy. Astrol. Zool. i. p. 184, pl. 6. Havre-Dorey (Q. & G.). Mus. Paris.

59. *Dicrurus carbonarius*, Müll. MS.

Bp. Consp. p. 352. Lobo (Müll.). Mus. Lugd.

## EURYLÆMIDÆ.

60. *Peltops Blainvillii*, Garn., sp.

*Eurylaimus Blainvillei*, Garn. Voy. Coq. i. p. 595, pl. 19; Bp. Consp. p. 169. Havre-Dorey (Garn.). Mus. Paris.

## MUSCICAPIDÆ.

61. *Arses chrysomela*, Less., sp.

*Muscicapa chrysomela*, Less. Voy. Coq. i. pl. 18. fig. 2; Müll. Verh. Ethn. p. 22. Havre-Dorey (Less.); Lobo (Müll.). Mus. Paris. et Lugd.

62. *Arses telescopthalma*, Garn., sp.

*Muscicapa telescopthalma*, Garn. Voy. Coq. i. p. 593, pl. 18. fig. 1; Müll. Verh. Ethn. p. 22. Havre-Dorey (Garn.). Lobo (Müll.). Mus. Par. et Lugd.

63. *Monarcha guttula*, Garn., sp.

*Musc. guttula*, Garn. Voy. Coq. Ois. pl. 16. fig. 2. p. 591; Bp. Consp. i. p. 326. Havre-Dorey. Mus. Par.

64. *Monarcha inornata*, Garn., sp.

*Musc. inornata*, Garn. Voy. Coq. Ois. pl. 16. fig. 1. p. 591. Havre-Dorey (Garn.).

65. *Todopsis cyanocephala*, Q. & G., sp.

*Todus cyanocephalus*, Q. & G., Voy. Astrol. i. p. 227, pl. 5, fig. 4; Voy. au P. S. pl. 20. fig. 2; Zool. iii. p. 79. Gen. *Todopsis*, Bp. Notes Orn. p. 80. Havre-Dorey (Q. & G.). Mus. Paris.



66. *Tchitrea Enado*, Less., sp.  
*M. Enado*, Less., Voy. Coq. i. p. 643, pl. 15. fig. 2. Havre-Dorey (*Less.*).
67. *Tchitrea Gaimardi*, Less., sp.  
*M. Gaimardi*, Less., Trait. d'Orn. i. p. 386.
68. *Rhipidura threnothorax*, Müll. & Schl.  
 Verh. Ethn. p. 185. Lobo (*Müll.*).
69. *Rhipidura rufiventris*, Müll. & Schl.  
 Verh. Ethn. p. 185. Lobo (*Müll.*).
70. *Rhipidura gularis*, Müll. & Schl.  
 Verh. Ethn. p. 185. Lobo, R. Oetanata and P. Marianne's Straits (*Müll.*).

## LANIIDÆ.

71. *Ptererythrius spinicaudus*, Puch.  
 Voy. au P. S. Zool. iii. p. 58, pl. 6. fig. 2. Gen. *Pucherania*, Bp. Notes Orn. p. 73. Warrior's Is., Torres Straits (*H. & J.*). Mus. Paris.
72. *Pachycephala lugubris*, Müll. MS.  
 R. Oetanata (*Müll.*). Mus. Lugd.
73. *Pachycephala virescens*, Temm. MS.  
 Lobo (*Müll.*). Mus. Lugd.
74. *Myiolestes megarhynchus*, Q. & G., sp.  
*Muscicapa megarhyncha*, Q. & G., Voy. Astrol. i. pl. 3. fig. 1, p. 172 ; Bp. Consp. i. p. 358. *Napothera elaeioides*, Müll. M.S. Havre-Dorey (*Q. & G.*). Mus. Lugd.
75. *Myiolestes pulverulentus*, Müll. MS.  
 Bp. Consp. p. 358. Mus. Lugd.
76. *Rectes cirrhocephalus*, Less., sp.  
*Vanga kirrhocephalus*, Less. Voy. Coq. i. p. 633, pl. 11. *Timalia poliocephala*, Müll. MS. Havre-Dorey (*Less.*) ; Lobo (*Müll.*). Mus. Par. et Lugd.
77. *Rectes dichrous*, Bp., sp.  
 Compt. Rend. xxxi. p. 563. *Garrulax bicolor*, Müll. MS. Lobo (*Müll.*). Mus. Lugd.  
 ♂ et ♀ similis. Saturate rufo-cinnamomeus, abdomine dilutiore ; capite cristato toto cum gutture, cervice, alis et cauda nigerrimis ; rostro et pedibus nigris : long. tota 8·5, alæ 3·75, caudæ 3·6, poll. angl. et dec.
78. *Rectes strepitans*, Puch., sp.  
 H. & J. Voy. au P. S. Ois. pl. 6. fig. 1 ; Zool. iii. p. 60. *Rectes ferru-*

*gineus*, Bp. Compt. Rend. xxxi. p. 563. West Coast of N. G. (H. & J.); Lobo (Müll.). Mus. Paris. et Lugd.

79. *Cracticus cassicus*, Bodd., sp.

Pl. Enl. 628; unde *Ramphastus cassicus*, Bodd., et *Coracias varia*, Gm., *Barita Sonnerati*, Less. Trait. d'Orn. i. p. 346. *Barita varia*, Müll. Verh. Ethn. p. 22. Lobo (Müll.). Mus. Paris.

80. *Cracticus personatus*, Temm. MS.

Albus, plaga dorsi medii et capite toto cum gutture et pectore nigerrimis; alis caudaque nigris, secundariarum pogoniis externis et rectricum apicibus albis; rostri cærulescenti-plumbei basi alba, pedibus nigris. Long. tota 11·5, alæ 6·7, caudæ 4·6 poll. angl. et dec.

Lobo (Müll.). Mus. Lugd. Nearly allied to *C. picatus* (Gould B. Austr. ii. pl. 50). Perhaps not different from the former species.

81. *Cracticus Quoyi*, Less., sp.

*Barita Quoyi*, Less. Voy. Coq. i. p. 639; Gould, B. Austr. ii. pl. 53. Havre-Dorey (Less.). Mus. Par. et Brit.

#### CORVIDÆ.

82. *Gymnocorvus senex*, Less., sp.

*Corvus senex*, Less. Voy. Coq. i. p. 651, pl. 24. *Gymnocorvus tristis*, Less. Tr. d'Orn. i. p. 327. Havre-Dorey (Less.). Mus. Paris.

83. *Corvus Orru*, Bp.

Consp. i. p. 385. Havre-Dorey (Less.). Mus. Paris.

#### PARADISEIDÆ.

84. *Manucodia chalybea*, Bodd.

Pl. Enl. 634; unde *Manucodia chalybea*, Bodd.: Sonn. Voy. Nouv. Guin. pl. 100, unde *Paradisea viridis*, Scop. *Phonygama viridis*, G. R. Gray, et Bp. Consp. i. p. 368; Müll. Verh. Ethn. p. 22. Havre-Dorey (Less.); Lobo (Müll.).

85. *Manucodia Keraudreni*, Less., sp.

*Barita Keraudreni*, Less. Voy. Coq. i. p. 636, pl. 13. *Chalybæus cornutus*, Cuv. *Phonygama Lessonia*, Sw. Havre-Dorey (Less.). Mus. Paris. et Lugd.

86. *Manucodia atra*, Less.

*Phonygama atra*, Less. Voy. Coq. i. p. 639. Havre-Dorey (Less.).

87. *Paradisea apoda*, Linn.

Less. Voy. Coq. i. p. 526. Aroo Isl. (Lesson). Mus. Par., Lugd. et Brit.

Mr. Wallace also has lately found this bird abundant at the Aru Isl. I am not aware of its having been observed alive upon the mainland of New Guinea.

88. *Paradisea papuana*, Bechst.

Less. Voy. Coq. i. p. 446; Müll. Verh. Ethn. p. 70; Bp. Consp. i. p. 413. Havre-Dorey (*Less.*); Lobo and r. Oetanata (*Müll.*). Mus. Par. et Lugd.

89. *Paradisea rubra*, Daud.

Bp. Consp. i. p. 443; Less. Voy. Coq. i. p. 662. Waigiou (*Less.*). Mus. Par. et Lugd.

90. *Diphyllodes speciosa*, Bodd., sp.

Pl. Enl. 631, unde *P. speciosa*, Bodd.: Sonn. Voy. Nouv. Guin. pl. 98, unde *P. magnifica*, Scop. Less. Voy. Coq. i. p. 446. Mus. Paris. et Lugd.

Skins of this bird were obtained by Lesson and Garnot from the natives at Havre-Dorey, but we have no record of its being found alive.

91. *Diphyllodes Wilsoni*, Cassin.

*Lophorina respublica*, Bp. Compt. Rend. 1850, p. 131, et Compt. Rend. 1850, p. 291. *D. respublica*, Bp. Consp. p. 413. *Paradisea Wilsoni*, Cassin, Pr. Ac. Sc. Phil. 1850, p. 57; Trans. Ac. Phil. Mus. Acad. Philadelph., specimen unicum!

In the 'Proceedings of the Zoological Society' for this year (p. 6), I have stated my reasons for preferring Mr. Cassin's name to Prince Bonaparte's for this bird.

92. *Cicinnurus regius*, Linn.

*P. regia*, Linn., Bp. Consp. i. p. 413; Müll. Verh. Ethn. p. 22; Less. Voy. Coq. i. p. 658. Havre-Dorey (*Less.*); Lobo and r. Oetanata (*Müll.*); Aru Isl. (*Wallace*). Mus. Par. et Lugd.

93. *Lophorina atra*, Bodd.

Pl. Enl. 632, unde *P. atra*, Bodd.: Sonn. Voy. Nouv. pl. 96, unde *P. superba*, Scop., Bp. Consp. p. 414. Mus. Paris. et Lugd.

Lesson obtained skins of this species from the natives at Havre-Dorey.

94. *Parotia searpennis*, Bodd., sp.

Pl. Enl. 633; unde *P. searpennis*, Bodd.; *Parotia aurea*, Bp. Consp. p. 414. Mus. Paris. et Lugd.

## EPIMACHIDÆ.

95. *Seleucides albus*, Blum., sp.

Bp. Consp. p. 412. Mus. Paris. et Lugd.

96. *Epimachus maximus*, Scop., sp.

Sonn. Voy. Nouv. Guin. pl. 101; unde *Merops maximus*, Scop., Bp. Consp. p. 412; *Epimachus filamentosus*, Müll. Verh. Ethn. p. 22. Lobo (*Müll.*). Mus. Lugd. et Paris.

97. *Ptilorhis magnifica*, Vieill., sp.

*Craspedophora magnifica*, Bp. Consp. p. 412; Gould, Suppl. B. Austr. Mus. Paris., Lugd. et Acad. Philadelph.

When examining the specimens of this bird contained in the magnificent collection of the Academy of Natural Sciences of Philadelphia, I noticed considerable differences between the Australian and New Guinea examples. In the former, the pectoral patch seemed to be broader and terminated below in a semi-circular form, in the latter to be much narrower and nearly straight in its lower margin.

## STURNIDÆ.

98. *Paradigalla carunculata*, Less.

Rev. Zool. 1840, p. 1; Voy. Bonite, Ois. pl. 1; Bp. Consp. p. 414; Mus. Paris. et Acad. Philadelph.

99. *Astrapia nigra*, Gm., sp.

Bp. Consp. p. 414. Mus. Paris. et Lugd.

100. *Calornis metallica*, Temm.

Pl. Col. 266. *Calornis Cantor*, Müll. Verh. Ethn. p. 21. Lobo (Müll.). Mus. Lugd.

101. *Gracula Dumonti*, Less., sp.

*Mino Dumontii*, Less. Voy. Coq. i. p. 653, pl. 25; Müll. Verh. Ethn. p. 22. Havre-Dorey (Less.); Lobo (Müll.). Mus. Lugd. et Paris.

## PSITTACIDÆ.

102. *Aprosictus amboinensis*, Linn.

*Psitt. amboinensis*, Linn. S. N. i. p. 141; Pl. Enl. 240. *P. dorsalis*, Q. & G. Voy. Astrol. i. p. 234, pl. 21, fig. 2; Müll. Verh. Ethn. p. 22. Havre-Dorey (Less.); Lobo (Müll.). Mus. Paris. et Lugd.

103. *Cyanorhamphus Novæ Guineæ*, Bp.

Consp. Psitt. in Cabanis' Journ. f. Orn.

Prince Bonaparte has included this name in his "Table of Parrots," but I am not aware that he has published any description of the bird.

104. *Trichoglossus cyanogrammus*, Wagl.

Wagl. Mon. Psitt. p. 554; Müll. Verh. Ethn. p. 108. West coast of N. G. (Müll.). Mus. Lugd.

105. *Trichoglossus placens*, Temm., sp.

*Psitt. placentis*, Temm. Pl. Col. 553; Müll. Verh. Ethn. p. 23. R. Oetana (Müll.). Mus. Lugd.

106. *Charmosyna papuana*, Scop., sp.

Sonn. Voy. Nouv. Guin. pl. 111. *Psitt. Papua*, Scop. *Psitt. Papuensis*, Gm. Less. Voy. Coq. i. p. 630; Müll. Verh. Ethn. 107. Havre-Dorey (Less.). Mus. Paris. et Lugd.

107. *Lorius domicella*, Linn.

Less. Voy. Coq. i. p. 627. Havre-Dorey (Less.). Mus. Paris. et Lugd.

108. *Lorius tricolor*, Stephens.

Pl. Enl. 168. *Psitt. Lory*, Less. Voy. Coq. i. p. 628. Havre-Dorey (Less.). Mus. Paris.

109. *Eos squamata*, Bodd., sp.

Pl. Enl. 684; unde *Psitt. squamatus*, Bodd. *Psitt. Guebiensis*, Less. Voy. Coq. i. p. 628. Havre-Dorey et Guebé (Less.). Mus. Paris. et Lugd.

110. *Chalcopsitta atra*, Scop., sp.

Sonn. Voy. Nouv. Guin. pl. 110; unde *Psitt. ater*, Scop.; *Psitt. Novæ Guineæ*, Gm., Bp. P. Z. S. Mus. Lugd.

111. *Chalcopsitta scintillans*, Temm., sp.

Pl. Col. 569; Müll. Verh. Ethn. p. 22. Lobo (Müll.). Mus. Lugd. et Paris.

The specimens of this bird in the Paris Museum were obtained at the Aru Isl. by MM. Hombron and Jacquinot.

112. *Eclectus cardinalis*, Bodd., sp.

Pl. Enl. 518; unde *Psitt. cardinalis*, Bodd., et *Psitt. puniceus*, Gm. *Eclectus puniceus*, Bodd. Pr. Z. S. 1849, p. 143; Less. Voy. Coq. i. p. 627. *Eclectus grandis*, Müll. Verh. Ethn. p. 22. Havre-Dorey (Less.); Lobo (Müll.).

113. *Polychlorus grandis*, Gm., sp.

Sonn. Voy. Nouv. Guin. pl. 108; unde *Psitt. polychloros*, Scop., et *Psitt. grandis*, Gm. *Psitt. Sinensis*, Less. Voy. Coq. i. p. 627. *Eclectus polychloros*, Müll. Verh. Ethn. p. 22. Gen. *Polychlorus*, Sclater in P. Z. S. 1857, p. 226. Lobo (Müll.); Havre-Dorey (Less.). Mus. Paris. et Lugd.

114. *Psittacodis Stavorini*, Less., sp.

Wagler, Mon. Psitt. p. 574, pl. 33. *Psitt. Stavorini*, Less. Voy. Coq. i. p. 628. I. Waigiou (Less.).

115. *Geoffroius personatus*, Shaw, sp.

*Psitt. batavensis*, Gm.; Müll. Verh. Ethn. p. 22, et *Psitt. Geoffroyi*, ibid. p. 107. Lobo (Müll.).

116. *Geoffroius Pucherani*, Bp.

*Pionus fuscicapillus*, Puch. Voy. au P. S. Zool. pl. 3, p. 111, pl. 25 bis, fig. 3. West coast of N. G. (H. & J.). Mus. Paris.

117. *Cyclopsitta Desmaresti*, Garn., sp.

Voy. Coq. i. p. 600, pl. 35; Müll. Verh. p. 22. Havre-Dorey (Garn.); Lobo (Müll.). Mus. Par. et Lugd.

118. *Cyclopsitta diophthalma*, H. & J., sp.

Ann. d. Sc. Nat. sér. ii., xvi. p. 313; Voy. au P. S. pl. 25\*. fig. 4 et 5; et Zool. iii. p. 107. S. coast of N. G. Mus. Par.

119. *Nasiterna pygmæa*, Q. & G., sp.

*Psitt. pygmæus*, Q. & G. Voy. Astrol. i. p. 232, pl. 21. *Micrositta pygmæa*, Less. Tr. d'Orn. p. 646; Müll. Verh. Ethn. pp. 23 et 107. Havre-Dorey (Q. & G.); r. Oetanata (Müll.).

120. *Cacatua Triton*, Temm.

Coup d'œil, s. l. Poss. Néd. iii. p. 405. *P. galeritus*, Less. Voy. Coq. i. p. 624, et Müll. Verh. p. 21. Havre-Dorey (Less.); west coast of N. G. (Müll.). Mus. Lugd.

This species is very nearly allied to the *C. galerita* of Australia. Mr. Gould (B. Austr. vol. v. p. 1) seems to consider it as hardly different.

121. *Cacatua æquatorialis*, Temm.

Coup d'œil s. l. Poss. Néd. iii. p. 405. *C. sulphurea*, Less. Voy. Coq. i. p. 625. Havre-Dorey (Less.). Mus. Lugd.

122. *Microglossa aterrima*, Gm., sp.

Less. Voy. Coq. i. p. 625. *Psitt. Goliath*, Müll. Verh. Ethn. p. 22; Gould, B. Austr. suppl. pt. i. pl. 5. Havre-Dorey et Waigiou (Less.); Lobo (Müll.). Mus. Paris. et Lugd.

123. *Microglossa Alecto*, Temm.

Bp. Consp. i. p. 7. Mus. Lugd.

## CUCULIDÆ.

124. *Centropus Menebeki*, Garn.

Voy. Coq. i. p. 600, pl. 3; Müll. Verh. Ethn. p. 22. Havre-Dorey (Less.); Lobo (Müll.).

125. *Eudynamys rufiventris*, Less., sp.

*Cuculus rufiventer*, Less. Voy. Coq. i. pl. 623. Havre-Dorey (Less.). Mus. Paris.

126. *Hierococcyx leucolophus*, Müll. & Schl.

Verh. Ethn. pp. 22 et 233. Lobo (Müll.). Mus. Lugd.

127. *Chrysococcyx lucidus*, Gm.

Müll. Verh. p. 21; Bp. Consp. p. 106; Gould, B. Austr. iv. pl. 39. Lobo (Müll.).

## COLUMBIDÆ.

128. *Goura coronata*, Linn.

Bp. Consp. ii. p. 96; Müll. Verh. Ethn. p. 22. Lobo (Müll.). Mus. Lugd. et Brit.

129. *Goura Victoriae*, Fraser.

Bp. Consp. ii. p. 96. *G. Steursii*, Temm. Mus. Lugd. et Brit.

130. *Calenas nicobarica*, Linn., sp.

Bp. Consp. ii. p. 95; Less. Voy. Coq. ii. p. 145.

131. *Ptilonopus viridis*, Linn., sp.

Bp. Consp. ii. p. 24; Knip, Pig. pl. 17; Müll. Verh. Ethn. p. 22. Lobo (Müll.). Mus. Lugd.

132. *Ptilonopus Lechlancheri*, Bp., sp.

*Trerolæma Lechlancheri*, Bp. Compt. Rend. xli. p. 247. Mus. Paris. et Brit.

133. *Ptilonopus cyanovirens*, Less., sp.

Bp. Consp. ii. p. 23; Less. Voy. Coq. i. p. 713. pl. 42. Havre-Dorey (Less.). Mus. Paris.

134. *Ptilonopus perlatus*, Temm., sp.

Pl. Col. 559; Bp. Consp. ii. p. 40; Müll. Verh. Ethn. p. 22. Lobo (Müll.). Mus. Lugd.

135. *Ptilonopus naina*, Temm., sp.

Pl. Col. 565; Bp. Consp. ii. p. 25; Müll. Verh. Ethn. p. 22. Lobo (Müll.). Mus. Lugd.

136. *Ptilonopus pulchellus*, Temm., sp.

Pl. Col. 564; Bp. Consp. ii. p. 22; Müll. Verh. Ethn. p. 22. Lobo (Müll.). Mus. Lugd.

137. *Ptilonopus superbus*, Temm., sp.

Bp. Consp. ii. p. 18; Gould, B. Austr. v. pl. 57; Müll. Verh. Ethn. p. 22. Lobo (Müll.). Mus. Lugd.

138. *Carpophaga myristicivora*, Scop., sp.

Bp. Consp. ii. p. 31; Sonn. Voy. Nouv. Guin. pl. 102; unde *C. myristicivora*, Scop. New Guinea (Scop.).

139. *Carpophaga bicolor*, Scop., sp.

Sonn. Voy. N. Guin. pl. 103. unde *C. bicolor*, Scop.; Bp. Consp. ii. p. 36. New Guinea (Sonn.). Mus. Brit.

142. *Carpophaga luctuosa*, Temm., sp.

Pl. Col. 247; Gould, B. Austr. v. pl. 60; Bp. Consp. ii. p. 36. New Guinea (Belcher). Mus. Brit.

143. *Carpophaga Müller*, Temm., sp.

Pl. Col. 566; Müll. Verh. Ethn. p. 23. R. Octanata (Müll.). Mus. Lugd.

144. *Carpophaga Pinon*, Q. & G., sp.

Col. Pinon, Q. &amp; G., Voy. Uranie, pl. 28. p. 118; Bp. Consp. ii. p. 37. I. Rawak (Q. &amp; G.). Mus. Paris.

145. *Carpophaga Zoa*, Less., sp.

Col. Zoa, Less. Voy. Coq. pl. 39. p. 705; Bp. Consp. ii. p. 38. Havre-Dorey (Less.). Mus. Paris.

146. *Carpophaga rufigastra*, Q. & G., sp.

Voy. Astrol. pl. 27, p. 245; Bp. Consp. ii. p. 38. Havre-Dorey (Q. &amp; G.). Mus. Paris.

147. *Carpophaga puella*, Less., sp.

Col. puella, Less. Man. d'Orn. p. 172; Bp. Consp. ii. p. 40; Müll. Verh. Ethn. p. 22. R. Octanata (Müll.). Mus. Lugd. et Brit.

148. *Macropygia Doreya*, Bp.

Consp. ii. p. 57. Mus. Paris.

149. *Geopelia humeralis*, Temm., sp.

Pl. Col. 191; Gould, B. Austr. v. pl. 72; Bp. Consp. ii. p. 93. Lobo (Müll.). Mus. Lugd. et Brit.

150. *Chalcophaps Stephani*, Puch.

Voy. au P. S. pl. 28. fig. 2; Zool. iii. p. 119; Bp. Consp. ii. p. 93. West coast of N. G. (H. &amp; J.); Lobo (Müll.). Mus. Paris. et Lugd.

151. *Eutrygon terrestris*, Puch., sp.*Trugon terrestris*, Puch. Voy. au P. S. Zool. iii. p. 123. pl. 28, fig. 1; Bp. Consp. ii. p. 86. West coast of N. G. (H. & J.). Mus. Paris.I have slightly modified the generic name of this peculiar type, *Trugon*, correctly written *Trygon* (τρυγών), having been previously used for another division by Prof. Reichenbach.

## STRUTHIONIDÆ.

152. *Casuarius Emeu*, Lath., sp.

Less. Voy. Coq. i. p. 717; Müll. Verh. Ethn. p. 109. Havre-Dorey (Less.); S.W. coast (Müll.).

## MEGAPODIDÆ.

153. *Tategalla Cuvieri*, Less.

Voy. Coq. i. p. 715, pl. 38. Havre-Dorey (Less.).



154. *Megapodius rubripes*, Temm.

Pl. Col. 411; Müll. Verh. Ethn. p. 23. R. Oetanata (Müll.). Mus. Lugd.

155. *Megapodius Freycineti*, Q. & G.

Voy. Uranie, Ois. pl. 32. p. 125. Isl. Waigiou and Guebé (H. &amp; J.).

156. *Megapodius Duperreii*, Less.

Voy. Coq. i. p. 700. pl. 36. Havre-Dorey (Less.).

There appears to be much confusion among the true *Megapodii*. In the Leyden Museum there are specimens of four distinct species:—1. *M. Freycineti*, ex Ternate (Forster); 2. *rubripes*, ex Nov. Guinea et Celebes; 3. *tumulus*, ex Australia; and 4. an undescribed species from Ceram.

## CHARADRIDÆ.

157. *Esacus magnirostris*, G. S. Hilaire, sp.

Temm. Pl. Col. 387; Gould, B. Austr. vi. pl. 6. R. Oetanata (Müll.). Mus. Lugd.

158. *Hiaticula inornata*, Gould.

B. Austr. vi. pl. 19. Oomaga Is., Torres Straits (Lieut. Ince); coast of N. G. (Gould).

159. *Glareola Isabella*, Vieill.G. *grallaria*, Temm.; Gould, B. Austr. vi. pl. 22; Müll. Verh. Ethn. p. 23. R. Oetanata (Müll.). Mus. Lugd.160. *Hematopus longirostris*, Vieill.Gould, B. Austr. vi. pl. 7. *H. ostralegus*, Müll. Verh. Ethn. p. 21? Coasts of N. G. (Müll.).161. *Streptilas interpres*, Linn., sp.

Raines Islets, Torres Straits (Gould).

## ARDEIDÆ.

162. *Herodias Novæ Guineæ*, Gm., sp.

Bp. Consp. ii. p. 121. Mus. Paris.

163. *Botaurus heliosylus*, Less.

Voy. Coq. Zool. i. p. 722. pl. 44; Bp. Consp. ii. 136. Havre-Dorey (Less.). Mus. Paris.

## SCOLOPACIDÆ.

164. *Himantopus leucocephalus*, Gould.

B. Austr. vi. pl. 7; Müll. Verh. Ethn. p. 21. Coasts of N. G. (Müll.).

165. *Numenius uropygialis*, Gould.

B. Austr. vi. pl. 43. *N. phaeopus*, Müll. Verh. Ethn. p. 22? Coasts of N. G. (Müll.).

166. *Schœniclus albescens*, Gould.

B. Austr. vi. pl. 31. *Tringa pusilla*, Müll. Verh. Ethn. p. 23. R. Oetanata (Müll.).

167. *Tringoides empusa*, Gould, sp.

*Actitis empusa*, Gould, B. Austr. vi. pl. 35. *T. hypoleucus*, Müll. Verh. Ethn. p. 22. Coasts of N. G. (Müll.).

## RALLIDÆ.

168. *Parra gallinacea*, Temm.

Pl. Col. 427; Gould, B. Austr. vi. pl. 25.

## LARIDÆ.

169. *Sterna melanauchen*, Temm.

Pl. Col. 427; Gould, B. Austr. vii. pl. 28; Müll. Verh. Ethn. p. 125. Coast of N. G. (Müll.).

170. *Sterna velox*, Rüpp.?

Müll. Verh. Ethn. p. 125. West coast of N. G. (Müll.).

## ERRATA.

Page 58, line 3, for FORMICA IRRITANS read FORMICA HOSTILIS.

— 101, crase under PELOPÆUS JAVANUS, the habitat Borneo. The species from Borneo is described in the paper on the Hymenoptera of Celebes, and named *Pelopæus benignus*.

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*Præcursores ad Floram Indicam*: being Sketches of the Natural Families of Indian Plants, with Remarks on their Distribution, Structure, and Affinities. By J. D. HOOKER, Esq., M.D., F.R.S. & L.S., and T. THOMSON, Esq., M.D., F.R.S. & L.S.

[Read March 3rd, 1857.]

It is our intention to offer to the Linnean Society, from time to time, systematic sketches of the Natural Orders of Indian Plants, chiefly derived from a careful study of the materials upon which we have both been for many years engaged.

We have been induced to draw up the present papers for two reasons: first, because no satisfactory advance can be made in the general botany of India, at the present time, except by the study of the Indian Herbarium now deposited at Kew, whilst many years must elapse before an equally extensive and complete series of specimens can be elsewhere brought together; and secondly, because the careful collation of these with each other, and with the Hookerian herbarium at Kew (of which indeed they form a part), supplies us with a vast quantity of invaluable data in botany, which must otherwise remain for years unpublished.

It was indeed mainly the unprecedented extent and intrinsic value of the Indian collections placed at our disposal by Sir W. J. Hooker, coupled with a request from the President and Council of

the British Association, that induced us to found a work upon them, designed to contain a complete account of the vegetation of India in all its aspects. The first volume of our 'Flora Indica' was printed in 1855, and we must refer to its introductory essay for a history of the rise and progress of Indian botany, and for details of the principal collections on which these sketches will be founded\*. Being unable to continue that work at present, we venture to hope that a temporary substitute, giving such an account of what it should consist of, as the following pages supply, may be acceptable to our fellow-botanists.

The Præcursores are intended to be literally what their name implies: to ourselves they will be a synopsis of the materials placed in order for critical study, when we shall be able to continue the 'Flora Indica'; and they may further be regarded as *præmonenda* for our contemporaries or successors, who may be about to study Indian plants, and who will gather from them a tolerably correct idea of the nature and extent of any Natural Order they may undertake to study; besides a certain amount of definite botanical information on each, and many indications of researches to be undertaken and investigations to be followed up.

It is not easy to say how far sketches of this kind can be considered as exponents of the vegetation of a country so extensive as India, extending in elevation from the level of the sea to 18,000 feet, and in area from Malacca to Afghanistan, and from Ceylon to Tibet; and still less can they be guides to the writings of the numerous botanists whose labours on Indian plants are scattered over the whole field of botanical literature. Our own researches, it is needless to say, cannot be much extended beyond a careful comparison with the best authorities of the 12,000 species and 300,000 specimens which we have to examine and classify, and which must pass many times under our scrutiny during the progress of the arrangement of the great Herbaria from which we derive our materials. In the course of such an undertaking as this, though

\* In addition to the collections there enumerated, we have to add the names of the following gentlemen who have contributed to Sir W. Hooker's very valuable materials for the 'Flora Indica': Dr. Ritchie of Bombay, an extensive collection from Concan and the Deccan, &c.; Dr. M'Clelland, a very large Pegu herbarium; the Rev. Mr. Foulkes, a considerable Peninsular collection; the Rev. Mr. Johnson, Cochin plants; Mr. Bartle Frere, Beloochistan plants. We have also to state that the whole of the late Dr. Stocks' collections have been incorporated with the duplicate Indian herbaria for distribution along with our own, and that we have to acknowledge the receipt of many valuable additional collections from Messrs. Edgeworth, Thwaites, Schmidt, Wight, and Law.

conducted with every precaution, under every advantage of books, the best-named Herbaria in Europe, and the constant revision and assistance of several distinguished botanists at Kew, so many mistakes must occur, that it is with great diffidence that we publish our first crude results in the present incomplete form. On the other hand, it is obvious that the collation of such Herbaria and books must yield at every stage of its progress a vast number of data regarding the distribution, structure, affinities, and nomenclature of Indian plants, which no other circumstances could elicit, and which no more detailed or critical investigations can afterwards subvert; and it is these which will give the chief, if not the whole, value to our sketches.

These data, if systematically collected and arranged, will assume the shape of a tolerably complete *catalogue raisonné* of the Flora of India, which will be most full and accurate as regards the number and distribution of the species, and least so as regards references and synonyms, and the limits of critical species\*. In the process of collecting them, we should in many cases be enabled to form more correct estimates of the relative value of those morphological differences upon which natural orders and genera are founded, than we could by a closer study of fewer species or genera; and we should be enabled to appreciate the effects of exposure, elevation, temperature, humidity, and other external agents, in modifying the characters of organs, which escape observation in the detailed study of a few specimens from a few localities only.

It remains to say something of the plan of these *Præcursores*. They are intended to comprise catalogues of all the plants known to us in each Natural Order; and these, or groups of these, will be prefaced by some general remarks. Well-known species will, in most cases, be simply named, and only such synonyms and references added as appear worthy of notice, and are not to be found in DeCandolle's '*Prodromus*,' and other works of standard authority in general use. We shall in many cases add as doubtful synonyms, names of plants which we have reason to think may be such, or which at any rate deserve a closer comparison than we can give. These references are, therefore, on no account to be

\* At least in the opinion of those who regard the essence of specific botany to be the successful searching after differences, however minute, rather than estimating the value and significance of such differences, and tracing identity of plan and structure under diversities of aspect, form, and external conditions.

considered as anything but suggestions. We shall give characters of new genera and species, with indications of their affinities; and we shall in some cases give monographs of imperfectly known genera. The localities will always be fully given, in accordance with the plan proposed in the 'Flora Indica,' and illustrated in the map of botanical provinces appended to that work. Following the habitats will be a brief guide to the extra-Indian distribution of the species.

SERIES I. STYLIDIEÆ, GOODENOVIEÆ, ET CAMPANULACEÆ  
(including LOBELIACEÆ).

We commence these sketches with the Gamopetalous *Epigynæ*, from their having been recently under our examination, and not from any considerations connected with their position in the series of Dicotyledonous plants. Their title to rank high in that series will, however, be considered very strong by those who regard cohesion and adhesion of the floral whorls, and a great deviation from the typical leaf, in the organs of which these consist, as certain indications of high development in a plant.

Of the *Stylidiæ* and *Goodenoviæ* there are very few representatives in India, though the former order reaches its northern and western limits in that country; advancing to Silhet in N. lat. 25°, and as far west as Ceylon, and we believe also Orissa; for though we have seen no specimens, a species is reported by Griffith to have been found in that country. Of the three Indian *Stylidiæ*, none are the same as New Holland species; but one, the *Stylidium uliginosum*, is certainly also found at Hong Kong. Hitherto it has been detected in no part of India except Ceylon, but it is so very nearly allied to the *S. Kunthii* of the Malayan Peninsula, Chittagong and Silhet, that it may prove to be a variety of that plant.

The *Goodenoviæ* are represented by two very widely distributed and variable littoral species: one of these appears to be the *Scævola Plumieri* of the West Indies, and is also found on both coasts of tropical Africa and in the Galapagos Islands; the other is also a Mauritius and Madagascar species, but has a wider eastern distribution than *S. Plumieri*, being spread over the Malayan islands, and the tropical coasts of Australia and Polynesia; it has many names, and is the *S. Kœnigii*, Vahl, of which *S. sericea*, Forst., is only a state, with more copious silky hairs on the



stem and in the axils of the leaves, than are ever found in the Indian plant.

Under *Campanulaceæ* we have included the *Lobeliaceæ* as a tribe, considering that they have no sufficient claims to rank as a separate order. It is true that the limits between these tribes are seldom disputed; but they are of very little value, and are founded on characters common to many species of both. The character most relied on is the connate anthers of *Lobeliaceæ*, but these are found in *Symphyandra* of *Campanulaceæ*, whilst various *Lobeliaceæ* have free anthers. Even the irregular corolla affords no good mark, for some states of the Australian *Wahlenbergia saxicola* have an oblique corolla, and unequal inclined anthers, of which two have the connective produced into an appendix, thus imitating a prevalent feature of *Lobeliaceæ*. In both tribes the fruit is either baccate or capsular, and in each the dehiscence takes place sometimes above and sometimes below the limb of the calyx.

The Indian *Lobeliaceæ* offer few structural peculiarities. We have, however, been obliged to found a new genus upon a remarkable and handsome species from the Sikkim Himalaya, identical with a mountain plant of Java, which we suppose to be the *Lobelia montana* of Blume.

The Indian *Campanuleæ* are a more extensive and very instructive tribe, and we have several remarkable forms to add to those which have been so well illustrated by Alphonse DeCandolle in his elaborate and able monograph. Of these novelties *Codonopsis* and its allies are the most anomalous, including as they do the beautiful genus *Cyananthus*, which, following Bentham, we unhesitatingly refer to this group, and which is indeed scarcely separable by technical characters from *Wahlenbergia* itself. In the 'Illustrations of Sikkim Himalayan Plants,' we figured the most remarkable Indian forms of *Codonopsis*, regarding several of them as subgenera, though founded upon extreme deviations from the prevalent arrangement of the floral whorls in *Campanulaceæ*. Our friend M. DeCandolle has since communicated to us by letter some valuable criticisms on the course we adopted; pointing out that some of the characters which we held to be of only subgeneric value, are of even ordinal value in other families of plants; and further, that if these subgenera are to be permanently considered as such, almost all the genera of *Campanulaceæ* may be merged into one. Of this we were perfectly aware, and indeed of more than this; namely, that the whole question of what should or should not constitute a genus, is involved in the consideration of

the limits of such a group as *Codonopsis* and its allies; and although, in accordance with M. DeCandolle's views, we have now raised these subgenera to the rank of genera, we have by no means altered our opinion of their relationship, and still less of their structural peculiarities. Indeed we have little doubt that, could we undertake a revision of the whole Order, these and many other of the present genera would be reunited as subgenera of larger groups.

Upon this subject we take the liberty of reading a note on the principles upon which genera should be established in Botany, communicated to us by Mr. Bentham, who has kindly embodied the views which we hold in common with him, in a memorandum\* appended to this communication.

The genera of *Campanulaceæ* are indeed, for the most part, quite artificial; and of this the best proof we can offer is to be found in the study of those already founded, and especially of the allies of *Codonopsis*. These include plants so nearly connected by natural characters of habit, colour, odour, and habitat, as well as by the structure of their flowers, that their close affinity has never been doubted; but some of them present more striking differences from one another, and more remarkable deviations from the common plan on which the Order is constructed, than any other plants in it. By far the greatest peculiarity is exhibited by *Campanumœa* and *Cyclocodon*, genera which present the paradox of a *calyx inferus* and a *corolla supera*. In *Cyclocodon* this anomaly is carried to the highest degree, the sepals being in *C. parviflorum* placed on the peduncle of the flower, far removed from the base of the corolla and ovary, whilst in *C. truncatum* and in *Campanumœa* they adhere to the base of the tube of the corolla. So remote from one another are the points of insertion of the calyx and corolla in both these instances, that the sepals have been described as leaflets of an involucre, though their development is opposed to this conclusion, and their æstivation is normally valvate. In *Codonopsis* the calyx is adherent to the base of the ovary, and the corolla is inserted at the point where the lobes of the calyx are given off: but so similar in other respects is one species of this genus to one of *Campanumœa*, that they can with difficulty be distinguished, except by a close comparison: and both these last-named genera again differ wholly from *Cyclocodon* in their ramification, large tuberous roots, twining stems, and foetid milky juice.

\* See p. 30 of this volume.

*Leptocodon* is a third genus, containing one species, entirely agreeing with *Codonopsis* and *Campanumœa* in its habit, ramification, and fœtid juice, and with the former genus in the structure and adhesions of its calyx, corolla, &c., but having five staminodia alternating with its stamens, and few ovules fixed to placentæ which are not in the axis of the cells of the ovary, but on the walls of the dissepiments.

Turning to the fruit of these genera, we usually find in *Codonopsis* a membranous or baccate fruit, bursting by three horny valves within the base of the corolla; but in *C. inflata* these valves appear to be obliterated, and the fleshy berry scatters its seeds by decay of its walls, like that of *Campanumœa* and *Cyclocodon*.

In dividing these difficult *Campanulaceæ* into genera, M. DeCandolle has laid much stress on the relation of the cells of the ovary to the calyx-lobes; but these, being rarely equal in number, are seldom available for technical characters. In *Campanumœa*, the sepals alternate with the ovarian cells; in *Cyclocodon*, they are opposite; in *Codonopsis rotundifolia* (when 5-celled), they are normally opposite, I believe, though I find some observations recording the contrary amongst my notes on the live plant.

Thus in keeping up the four genera, *Campanumœa*, *Codonopsis*, *Leptocodon*, and *Cyclocodon*, we find ourselves obliged to go beyond M. DeCandolle, who, in his last revision of the *Campanulaceæ* (Prodr. vol. vii.), places all the species of *Codonopsis*, as restricted by us, in *Wahlenbergia*, and retains the name *Codonopsis* for Wallich's *C. truncata* and *C. parviflora*, also keeping up Blume's genus *Campanumœa*. But as one of his species of *Campanumœa* is identical with *Codonopsis parviflora*, Wall., and the typical species of *Codonopsis* differ from *Wahlenbergia*, it is necessary to remodel all these genera. In the mean time, considering the present state of the genera of *Campanulaceæ*, we have thought it better to adopt M. DeCandolle's opinion, and raise the subgenera of *Codonopsis* to the rank of genera.

The only other important observation to which we would call attention, is the presence in the same individual of some species of *Campanula* of two forms of flowers, differing remarkably, not only in size and appearance, but in structure; of these one kind is normal, the other very minute, generally on very long and more slender pedicels, with a more globose ovary, differently formed (often more foliaceous) sepals, and no corolla or stamens. These dimorphous flowers sometimes occur on the same

plant; at others, individual plants will present only one form of flower. Such species are of course polygamous, and in some cases the two forms would at first sight be referred to different divisions of the genus, and have indeed been described as different species by our predecessors. The small flowers appear, and arrive at maturity, contemporaneously with the large, and like them produce abundance of seeds. So far as we are aware, this singularity is confined to the Indian species, for we have failed to detect it in the Persian ones that are nearly allied to the Indian, or in any others, though we have searched for them with some care throughout the extra-Indian species. Though unnoticed, we believe, by any naturalist, this dimorphism is a very prevalent character of several species, both tropical and temperate, including the most common of all (*C. canescens*, Wall.).

#### Nat. Ord. STYLIDIEÆ.

1. *Stylidium Kunthii*, Wall. An var. *S. uliginosi*?

*Hab.* Arenosis Bengalæ orientalis; Silhet! *Wallich*, &c., et Chittagong! necnon in Peninsulâ Malayanâ ad Mergui! *Griffith* (fl. temp. frigid.) (v. v.)

2. *Stylidium uliginosum*, Swartz.

*Hab.* Insulâ Ceylon! *Walker*, *Champion*.—*Distr.* Chinâ meridionali ad Hong Kong.

3. *Stylidium tenellum*, Swartz.

*Hab.* Peninsulâ Malayanâ ad Malacca! et Mergui! *Griffith*.

#### Nat. Ord. GOODENOVIÆ.

1. *Scævola Kænigii*, Vahl.—*S. Bela Mogadam*, R. & S.—*S. Lambertiana*, de Vriese.—*S. chlorantha*, de Vriese.—*S. Taccada*, Roxb.—*S. sericea*, Forst. est varietas ramulis, axillis, &c. barbatis.

*Hab.* Littoribus oceani ad Ceylon! *Champion*; Martaban! Concan! et Scinde! *Dalzell*, *Stocks*, &c. necnon in Peninsulâ Malayanâ! *Wallich*, &c.—*Distr.* China! ins. Oceani Indici! et Pacifici! Mauritius! et Madagascar!

2. *Scævola Plumieri*, Vahl.—*S. Thunbergii*, Eckl. & Zeyh.—*S. uvifera*, Stocks (Wight, Ic. 1613).—*S. Senegalensis*, Presl.

*Hab.* Littoribus oceani ad Ceylon! *Herb. Thwaites*, 1777; Malabar et Scinde! *Vicary & Stocks*.—*Distr.* Africa tropica! India occidentalis! et in insulis Galapagœis!

## Nat. Ord. CAMPANULACEÆ.

## Tribe I. CAMPANULÆÆ.

## Gen. I. CEPHALOSTIGMA.

1. *Cephalostigma paniculatum*, A. D.C.

*Hab.* Birmâ ad Prome! *Wallich.*

2. *Cephalostigma hirsutum*, Edgew. in Linn. Trans. xx. p. 81.—*C. Schimperii*, Hochst. Plant. Abyss. 69.—*Wahlenbergia perotifolia*, W. & A., Wight, Ic. 842.

*Hab.* Collibus siccis Himalayæ occidentalis; Kumaon! *Strachey* & *Winterbottom*; montium Khasia! (alt. 4000 ped.) et Peninsulæ! *Wight*, *Stocks*, *Law*, *Dalzell*, &c. (fl. Sept.) (v. v.)—*Distr.* Abyssinia.

## 3. CEPHALOSTIGMA FLEXUOSUM, Hf. &amp; T. Caulibus hispido-pilosis simpliciusculis gracillimis flexuosis superne paniculatim ramosis, ramis filiformibus, foliis sessilibus late ovato-oblongis obtusis subsinuato-dentatis supra glaberrimis subtus secus costam et nervos sparse pilosis, floribus gracile-pedicellatis, calycis tubo late hemisphærico lobisque hispidis, corollæ profunde 5-fidæ lobis lineari-oblongis calycem paulo superantibus, filamentis basi rhombeis ciliatis, stylo exserto, stigmatē capitato 3-lobo.

*Hab.* Concan! *Dalzell*, *Stocks.*

*Herba* 5–8 uncialis, caule angulato; *folia*  $\frac{3}{4}$  unc. longa, interdum in petiolum brevem angustata, marginibus glabris ciliatisve.—*C. hirsuto*, Edgew., accedit, sed differt conspicue caule graciliore flexuoso, foliis multoties latioribus non undulatis, pedicellis longioribus, calyceque setis longis rigidis hispidulo.

Gen. II. CAMPANUMÆA, *Blume.*

*Calyx* inferus; *sepala* 5 basi ovarii adherentia, patentia. *Corolla* supera, campanulata, breviter 5-loba. *Stamina* 5, libera, filamentis filiformibus basi subdilatatis; antheris oblongis. *Discus* epigynus depressus, obscure lobatus. *Ovarium* depresso-globosum, 5-loculare, basi 5-costatum; loculis multiovulatis, ovulis multiseriatis placentis crassis axillaribus adnatis; *stigma* clavatum, 5-lobum, lobis valvatis extus dense pilosis. *Fructus* membranaceus v. subbaccatus, indehiscens, irregulariter ruptus. *Semina* minima, oblonga.—*Herbæ succo lacteo scatentes*; radice magno, tuberoso; caule volubili; foliis alternis, oppositis, subverticillatisve; floribus axillaribus v. terminalibus.

1. CAMPANUMÆA JAVANICA (*Blume*, *Bijl.* 726). Glaberrima, scandens, foliis oppositis cordatis acutis subcrenatis subtus glaucis, sepalis basi ovarii adnatis, floribus pentameris.—*Alph. D.C. Monog.* 119,

*et in D.C. Prodr.* vii. 423. *Codonopsis*, § *Campanumœa Javanica*, *Hf. & T. in Ill. Himal. Plants*, t. xvi. B.

*Hab.* In Himalayâ orientali temperatâ, alt. 5000–6000 ped. Sikkim! *J. D. H.* In montibus Khasia, alt. 4000–6000 ped. graminosis! *Griffith, Hf. & T.* (fl. Jul.) (v. v.)—*Distr.* Java! *Blume, Lobb.*

*Caules* graciles, volubiles. *Folia* 1–2 pollicaria, basi cordata v. biloba, sinu lato interdum ad insertionem petioli dilatato, acuta v. subobtusata, crenata rarius integerrima, membranacea, superne pallide viridia; petiolo  $\frac{1}{2}$ – $\frac{3}{4}$  longit. laminæ. *Flores* solitarii,  $\frac{3}{4}$ – $1\frac{1}{2}$  poll. longi, axillares, virescentes; pedicellis petiolæ æquilongis longioribusve. *Calyx* in alabastro magnus, vacuus, basi florem parvum gerens. *Sepala* basi ovarii adnata, ovato-lanceolata v. ovato-oblonga v. linearia, obtusa v. acuta, magnitudine varia, plerumque  $\frac{1}{4}$ – $\frac{1}{3}$  longit. corollæ, post anthesim crescentia. *Corolla* supera, breviter tubuloso-campanulata, basi lata obscure 5-angulata, lobis vix patentibus late ovatis apicibus acutis papillosis. *Filamenta* lineari-subulata, glabra, basi vix dilatata. *Anthere* lineares, connectivo apiculatæ. *Stylus* columnaris, teres, glaber, apice obconico pubescente in ramos stigmaticos late oblongos revolutos dilatatus. *Ovarium* late hemisphæricum, obscure 10-costatum, 5-loculare; loculis sepalis alternantibus. *Bacca* pulposa v. submembranacea, purpurea, calyce persistente sæpissime aucto suffulta,  $\frac{1}{2}$ –1 un. diametro, 5-locularis, evalvis; semina placentis latis axillaribus multiserialiter affixa, oblonga, sessilia. *Testa* coriaceo-crustacea, areolis suborbiculatis minute tessellata, exemplaribus per plurimos ab omnibus patriis examinatis vacua!—Odor vix ullus, graveolens.

The flowers vary extremely in size, the calyx-lobes in proportionate size to corolla and in shape, and they further continue growing after the corolla withers. *Berry* purple or green, walls fleshy or membranous.

## 2. CAMPANUMŒA LANCEOLATA (*Sieb. & Zucc. Flor. Jap.* i. 174. t. 91).

Caule volubili, foliis alternis v. subfasciculatis breviter petiolatis oblongo-lanceolatis utrinque attenuatis acutis integerrimis glabris subtus glaucescentibus, floribus terminalibus solitariis, calyce imo basi ovarii adnato.—*Campanumœa lanceolata*, *Planch. in Flore des Serres*, t. 927; “*Fl. Jap.* 1. c.” *Tsuru ninzin*, *Thunb. Fl. Jap.*, *Plant. obscuræ*, n. 21. p. 353.

*Hab.* Chinâ, fide *Siebold*, in Japoniâ culta, *Siebold*.

*Radix* tuberosa, crassa, fere ut in *Panace quinquefolio* (unde nomen Jap. vern. Ninzin). *Caulis* 2–3 pedalis, glaber, purpurascens. *Folia* in caule alterna, in ramulis approximata, breviter petiolata, 1–2 unc. longa, integerrima v. irregulariter et remote crenulata, reticulatim venosa. *Flores* in apice ramulorum abbreviatorum in racemum brevem simplicem bracteolis parvis lanceolatis munitum dispositi, plerique abortivi, pedunculo tereti erecto. *Calyx* ovario basi adnatus, ceterum liber; tubus hemisphæricus, extus 10-sulcatus, glaber, limbus

5-partitus, laciniis ovato-lanceolatis integerrimis, corolla  $\frac{1}{2}$  brevioribus. *Corolla* perigyna, magnitudine *Campanulæ Trachelii*; extus pallide lilacina, intus hepatico-violacea, glabra; limbi laciniis ovato-delloideis acutis tenuissime papilloso-ciliatis. *Discus* 4-angularis, carnosus, glaber, olivaceus. *Stamina* 5, libera; filamentis longitudine tubi corollæ. *Antheræ* 4 (?) - loculares, 4 (?) - valves. *Ovarium* 3-loculare. *Stylus* longitudine staminum, a medio apicem versus dense papillosum. *Stigma* incrassatum, infundibuliforme, 3-lobum.

The above description is abridged from Siebold and Zuccarini's beautiful work; those writers describe the root as sweet with an after bitter taste, and add, that it is considered an efficacious remedy in complaints of the chest and chronic affections of the lungs. We have queried the description of the anthers, which are said to be 4-locular, probably being a clerical error for 2-locular, as they appear to be in the plate, and in that given in the 'Flore des Serres.'

### Gen. III. CODONOPSIS, Wall.

*Calyx* superus, 5-lobus. *Corolla* tubulosa v. campanulata, 4-6-loba. *Stamina* 4-6, libera; filamentis basi subdilatis filiformibus; antheris oblongis. *Discus* epigynus carnosus, depressus, obscure lobatus. *Ovarium* costatum, globosum v. obconicum, pars superior truncata v. conica, in stylum rectum attenuatum, 3-5-loculare, loculis multiovulatis; *ovulis* multiseriatis, placentis crassis axillaribus adnatis. *Stigma* clavatum, 3-5-lobum, lobis valvatis intus planis extus dense pilosis, sub anthesim recurvis. *Fructus* pars infra corollam baccata indehiscens v. irregulariter rupta, pars superior conica coriacea v. cornea, 3-5 valvis. *Semina* oblonga, testa crustacea v. coriacea, lævia v. reticulata; albumine copioso carnosus; embryo tereti.—*Herbæ volubiles v. suberecti*; *succo lacteo v. aqueo, sæpissime fætido*; *glaberrimæ v. pilosæ*; *caulibus simplicibus v. ramosis*; *foliis oppositis alternisve*; *floribus sæpius magnis, terminalibus, axillaribus, oppositifoliis v. extra-axillaribus, cernuis pendulisve*. *Corolla membranacea v. subherbacea, cærulea, virescens v. sordide alba, purpureo-variegata et venosa, lobis brevibus, papilloso-ciliatis*. *Pollen globosum, læve v. muricatum*. *Ovarii loculi dum numero sepalis æquales iis oppositi vel alterni; dum pauciores oppositi et alterni; stigmatibus lobis loculis ovarii oppositis, extus et basi dense pilosis, pilis basi papillis cellulosi insidentibus; ovulis anatropis, integumentis cum nucleo conferruminatis*.

1. *CODONOPSIS VIRIDIS* (Wall. in Roxb. *Fl. Ind.* ii. 103). Volubilis, ramis glabris, ramulis foliisque præsertim subtus canis cano-tomentosisve, foliis oppositis alternisque ovatis oblongis ovato-lanceolatisve acutis acuminatisve, pedicellis axillaribus et oppositifoliis, calyce pubescente lobis angustis, ovario hemisphærico, corolla late campanulata, bacca depresso-globosa apice conica, valvis 3-5 corneis.—Wall. *Cat.* 1298; *Alph. D.C. Mon. Camp.* 120. *Wahlenbergia viridis*, A.D.C. *Prodr.* vii. 425. *Campanula viridis*, *Spreng. Cur. Port.* 78. *Codonopsis* 2 & 3, t. 372, *Griff. Not.* iv. 280, 281.

*Hab.* In sylvis temperatis Himalayæ; Nipal! Wall.; Kumaon, alt. 7000 ped.! *Blinkworth, Madden*; Montibus Khasia, alt. 5000-6000 ped.! graminosis, *Griffith*, &c. (fl. Sept.) (v. v.)

*Fœtida.* Rami debiles, glabri, nitidi, ramulis pubescentibus villosisve. *Folia* opposita et alterna, glabrata v. cano-pubescentia v. in exemplaribus Khasianis cano-tomentosa, petiolo gracili  $\frac{1}{2}$ -1 pollicari, lamina latitudine varia, 2-4 unciali, membranacea, basi rotundata rarius cordata, apice acuta v. acuminata, margine integerrima v. obscure crenato-dentata. Flores magnitudine variabiles. *Calycis* tubus late hemisphæricus, lobis distantibus, linearibus, patentibus, integerrimis v. subdentatis. *Corolla*  $\frac{1}{2}$  unc. longa, late cylindraceo-campanulata, lobis brevibus, late ovatis, acutis, glaberrima v. puberula, plerumque pallide viridis, intus basi purpurascens, lobis venosis apicibus rubris. *Bacca*  $\frac{1}{2}$ -1 unc. lata, carnosula, valvis corneis. *Semina* pallide fusca v. sordide flava; testa reticulata.

The Khasia Mountain specimens are usually more downy than the Himalayan ones, the leaves being sometimes almost villous on both surfaces, but we find no other difference between them and the Kumaon specimens; the latter are sometimes almost glabrous.

2. *CODONOPSIS AFFINIS* (Hf. & T.). Volubilis, ramis glabris, ramulis ultimis puberulis, foliis ovato-cordatis basi profunde bilobis superne glabris subtus cano-pubescentibus, pedunculis oppositifoliis, calycis tubo hemisphærico lobis lineari-oblongis lanceolatisve puberulis, corolla late cylindraceo-campanulata, fructu ut in *C. viridi*.

*Hab.* In sylvis et fruticetis temperatis Himalayæ orientalis; Sikkim vallibus Lachen et Lachung, alt. 6000-9000 ped.! *J. D. H.* (fl. Aug.) (v. v.)

*C. viridi* simillima, sed foliis brevius petiolatis magis coriaceis et semper basi profunde bilobo-cordatis, lobis rotundatis, sinu clauso v. aperto. *Flores* virescentes, apicibus lorum corollæ rubris. *Calycis* lobi latiores quam in *C. viridi*.

3. *CODONOPSIS PURPUREA* (Wall. in Roxb. *Fl. Ind.* ii. 105). Glaberrima, caule scandente fragili nodis incrassatis, foliis oppositis breve petiolatis lanceolatis ovatis ovato-lanceolatisve acutis basi subacutis membranaceis subtus glaucis, pedicellis terminalibus axillaribus



oppositifoliisque petiolis multoties longioribus, calycis tubo conico, lobis late ovato-lanceolatis acutis corolla late cylindracea dimidio brevioribus.—*Wall. Cat.* 1299! *Alph. D.C. l. c.* 121. *Wahlenbergia purpurea*, *Alph. D.C. Prodr.* vii. 425. *Campanula purpurea*, *Spr. Cur. Port.* 78.

*Hab.* In Himalayâ temperatâ centrali, Nipal! *Wallich.* Kumaon, alt. 6000 ped.! *Strachey & Winterbottom* (fl. æstate).

Herba ut videtur scandens, sed vix volubilis. *Caulis* glaberrimus, nitidus, fragilis, ad nodos incrassatus, sed vix articulatus. *Folia* 1-3 unc. longa,  $\frac{1}{2}$ -1 $\frac{1}{2}$  lata, membranacea, integerrima v. leviter subcrenulata, basi acuta v. subrotundata, apice acuta v. acuminata, subtus glauca; petioli  $\frac{1}{4}$ - $\frac{1}{3}$  unc. longi. *Pedicelli* validi suberecti, plerumque oppositifolii, rarius terminales, pollicares. *Calycis* tubus glaberrimus, late obconicus, lobis  $\frac{1}{2}$ - $\frac{1}{3}$  unc. longis. *Corolla* purpurea, 1 unc. longa.

This species appears, from the dried specimens we have examined, and which are all rather poor, to be hardly a twiner to the same extent as the other species of this section are. The leaves are almost constantly opposite, except where one is replaced by a peduncle. The stems are very shining and brittle, the leaves membranous and flowers large. It cannot be confounded with any other.

4. *CODONOPSIS INFLATA* (*Hf. & T. Ill. of Him. Plants*, t. xvi. c.). Glaberrima, volubilis, foliis alternis ovatis triangulari-ovatisve acuminatis basi late v. profunde cordato-bilobis sinu lato v. angusto, pedunculis oppositifoliis v. supra-axillaribus, calycis tubo obconico angulato lobis late ovato-oblongis acutis, corolla ventricoso-cylindracea ampullacea infra lobos breves contracta, bacca carnosa angulata sulcata apice 3-valvi, valvis brevibus corneis.

*Hab.* In sylvis et fruticetis Himalayæ temperatæ orientalis. Sikkim, montibus exterioribus alt. 5000-6000 ped.! (fl. Aug.) (v. v.)

*Caules* 8-10 pedales, ramosi, glaberrimi, novelli puberuli. *Petioli* graciles, 1-1 $\frac{1}{2}$  pollicares. *Folia* majuscula, 2-4 uncialia, exacte ovato-cordata v. triangulari-ovata, acuminata, integerrima v. rarius crenulata, subtus glaucescentia, basi late v. profunde cordata, lobis rotundatis patentibus conniventibus. *Pedunculi* interdum cum caule longe connati hinc supra-axillares v. oppositifolii, petiolis subæquilongi. *Flores* magni, pallide sordide flavi, purpureo-venosi, et interdum rubro pallide suffusi. *Calycis* tubus 8-10 sulcatus et angulatus, lobis latis foliaceis patentibus. *Corolla* pollicaris. *Bacca* purpurea, glauca, carnosa, sulcata et angulata, late oblongo-obconica v. subcylindracea, truncata, apice breviter 3-valvi, valvis parvis corneis; interdum ut videtur omnino carnosa et indehiscens, magnitudine et forma variabilis,  $\frac{1}{2}$ -1 $\frac{1}{4}$  unc. longa. *Semina* oblonga; testa sordide fulva, reticulata.

5. *CODONOPSIS ROTUNDIFOLIA* (*Benth. in Royle, Ill. Bot. Him. 254. t. 62*). Caule volubili piloso, foliis gracile petiolatis ovatis rotundatisve obtusis v. acutis basi rotundatis cordatisve grosse crenatis, pedunculis oppositifoliis petiolis longioribus interdum subterminalibus, calycis tubo angulato et sulcato lobis magnis foliaceis, corolla late campanulata breviter 5-loba, bacca carnosâ apice valvis 3 corneis conicis dehiscente.—*Hook. in Bot. Mag. t. 4942. C. lurida, Lindley. Wahlenbergia rotundifolia, Alph. D.C. Prodr. vii. 425.*

*Hab.* In sylvis et fruticetis Himalayæ temperatæ occidentalis; Kumaon! *Royle*; alt. 10,000 ped.! *Strachey & Winterbottom*; Kulu! 6000–7000 ped.! *Edgeworth*; Kishtwar, 8000 ped.! *T. T. (v. v.)*

*Caulis* patentim pilosus v. glabratus, nitidus. *Folia* opposita et alterna, 2–4 unc. longa, membranacea, glaberrima v. parce pilosa. *Pedunculi* plerumque oppositifolii, rarius ob ramulum lateralem abbreviatum quasi terminales, petiolis plerumque longiores, validi. *Flores* majusculi,  $\frac{2}{3}$ –1 unc. longi. *Calycis* tubus basi rotundatus; lobis amplis, membranaceis, obtusis v. acutis, crenatis integerrimisve, corolla paulo brevioribus. *Corolla* sordide cærulescens v. virescenti-albida, colore varia, late cylindraceo-campanulata. *Bacca* ut in congeneribus forma et diametro varia, sulcata, subcylindraceo-obconica v. subglobosa, purpurea, carnosâ, apice valvis 3 corneis longitudine variis dehiscens. *Semina* sordide flava, testa reticulata.

The broad foliaceous calyx-lobes at once distinguish this species from any except *C. Benthami*. The peduncles never seem to be terminal in the same sense as they are in the following section, but are generally manifestly opposite the leaves, or attached to the stem below them; that of the upper flower is however so much stouter than the branch beyond it, as to approach in appearance a terminal inflorescence. *Royle's* cultivated specimens seem to be quite glabrous, and *Strachey and Winterbottom's* are almost so too. *Thomson's* and *Edgeworth's* are more pilose. The fruit is extremely variable in size and form. The specific name is a bad one, some specimens bearing ovate leaves on the same individual with the rounded ones, and in others they are all ovate-cordate. The species is cultivated at Kew, both in the open air and in a cool greenhouse; in the latter the plants are always paler and more membranous, with broader leaves and larger flowers.

6. *CODONOPSIS BENTHAMII* (*Hf. & T.*). Caule volubili ramoso rarius puberulo, foliis (rarius suboppositis) petiolatis ovatis ovato-lanceolatisve acutis grosse obtuse serratis basi acuminatis rotundatisve parce pubescentibus glabratissive subtus pallidioribus, pedunculis terminalibus, calycis tubo 5-costato lobis ovatis lanceolatisve acuminatis ciliatis

subserratis, corollæ cylindrææ limbo erecto breviter 5-loba, bacca carnosa apice valvis 3 dehiscente.

*Hab.* In sylvis et fruticetis Himalayæ orientalis temperatæ, Sikkim, alt. 9000–11,000 ped. ! (fl. Jul.) (v. v.)

*C. rotundifoliæ* proxima; differt caule robustiore, foliis majoribus et angustioribus acuminatis nunquam patentim pilosis, floribus terminalibus, corolla tubulosa longiore et angustiore.

We were for some time inclined to consider this as an Eastern form of the Western *C. rotundifolia*, but cannot venture to unite them. The plant has a very heavy, rank, almost hircine smell when fresh.

7. *CODONOPSIS OVATA* (*Benth. in Royle, Ill. Bot. Him.* 253. t. 69. f. 3). Caule ramoso ascendente pubescenti-piloso pilis reflexis, foliis breve (v. longius) petiolatis ovatis ovato-cordatis lanceolatisve pubescentibus inferioribus et ramorum steriliis oppositis, pedunculo terminali valido erecto 1–3-floro superne nudo v. parce foliato, calycis tubo obconico-hemisphærico, lobis ovatis acutis pilosis corolla ampla cylindrææ apice 5-loba  $\frac{1}{3}$ – $\frac{1}{4}$  brevioribus, stigmate dilatato, capsula utrinque conica basi coriacea apice valvis 3 elongatis corneis.—*Lindl. in Gard. Chron.* 1856, p. 468. cum xylog. *Wahlenbergia Roylei*, *A. D. C. Prodr.* vii. 425. *W. clematidea*, *Schrenk. En. Pl. Soong.* v. 38.

Var.  $\beta$ . *ramosissima*, foliis flaccidis gracile petiolatis.

*Hab.* In sylvis et fruticetis Himalayæ boreali-occidentalis temperatæ, Kashmir! *Herb. Royle.* In Tibetiâ occidentali, Ladak! et Piti! alt. 9000–11,000 ped., *T. T.*; Afghanistan! *Griffith*, var.  $\beta$ . Baltal, Kashmir, alt. 9500 ped. ! *T. T.* (fl. August.) (v. v.)—*Distr.* Soongaria!

Species annua?, foetida, odore hircino, variabilis, 1–3-pedalis, e basi ramosa. *Caules* ascendentes, sæpe ramulosi, in pedunculos validos erectos apice curvos desinentes, ramulis plerumque non florentibus foliis minoribus oppositis alternisve onustis: pubes omnibus partibus brevis, densus v. laxus, pilis patulis vel sæpius deflexis immixtus. *Folia* sessilia v. petiolata  $\frac{1}{2}$ – $1\frac{1}{2}$  unc. longa, plerumque  $\frac{1}{3}$ – $\frac{2}{3}$  pollicaria, acuta, integerrima, submembranacea, basi rotundata v. cordata v. acuta; in exemplaribus Tibetis minoribus, densius pubescentia; in locis humidioribus membranacea majora. *Pedunculi* 1–3-flori. *Flores* cernui v. nutantes, ampli, pallide cærulei,  $\frac{2}{3}$ – $1\frac{1}{4}$  unc. longi. *Corolla* breviter 5-loba. *Stigma* amplum, dilatatum, cupulæforme, 3-lobum, lobis erectis, extus densissime villosum. *Capsula*  $\frac{1}{2}$  unc. longa, erecta, basi brevi-obconica, valvis 3 elongatis corneis. *Semina* lineari-oblonga, testa nitida flavo-brunnea.

The Kashmir specimens are much larger, more flaccid, branched, and have more slender petioles than the Tibetan ones: these differences are without doubt due to climate. Griffith's specimens have some of the leaves narrower than any of the Himalayan or Tibetan ones.

8. *CODONOPSIS SUBSIMPLEX* (Hf. & T.). Parce pilosa v. subpubescens, caule ascendente simplici v. e basi ramoso parce foliato, foliis petiolatis ovatis lanceolatis cordatisve crenatis, subtus glaucis, pedunculis terminalibus gracilibus 1-3 floris, pedicellis nudis v. 1-2-foliatis, calycis tubo hemisphærico lobis majusculis ovato-lanceolatis acuminatis corollam brevem late cylindraceam 5-lobam æquantibus, capsula breviter depresso-obconica, apice breviter 3-valvi.

*Hab.* In vallibus interioribus Himalayæ orientalis temperatæ. Sikkim, alt. 12,000-13,000 ped. ! (fl. Jul.), (v. v.)

*Herba* glabriuscula, 1-2-pedalis; *caules* basi ramulos breves foliaceos emittentes, deinde ascendentes graciles simplices, in axillis foliorum ramulos abbreviatis bifolios gerentes. *Folia* sparsa, alterna, membranacea,  $\frac{1}{2}$ -2 unc. longa, grosse inæqualiter crenata, acuta, acuminata v. obtusa, petiolo gracili  $\frac{1}{4}$ - $\frac{3}{4}$  unc. longo. *Pedunculus* seu caulis apex simplex v. bis terve divisus. *Flores* nutantes v. cernui, pallide sordide cærulei,  $\frac{3}{4}$  unc. longi, æquilaterales. *Calycis* lobi integerrimi v. subcrenati.

This is a much less branched plant than *C. ovata*, almost glabrous, with fewer, more membranous, larger, crenate leaves, much shorter flowers with larger (relatively) calyx-lobes, almost as long as the corolla, and a very broad depressed capsule with short horny valves. We have not, however, seen perfectly mature fruit.

9. *CODONOPSIS THALICTRIFOLIA* (Wall. in Roxb. *Flor. Ind.* xi. 106).

Pubescens, caule ascendente basi ramulos plurimos breves foliosos graciles emittente superne in pedunculum longe nudum 1-2-florum desinente, foliis parvis oppositis alternisque pubescentibus petiolatis ovatis late cordatisve acutis obtusisve integerrimis v. obscure crenatis, calycis tubo late hemisphærico v. obconico lobis oblongis obtusis, corolla tubulosa cylindracea breviter 5-loba calyce 3-plo longiore, antheris mucronulatis extus villosis, stigmate dilatato, capsula basi late hemisphærica valvis 3 elongatis corneis.—*Benth.* in *Royl. Ill. Plant. Himal.* 253. *Glossocomia thalictrifolia*, Wall. *Cat.* 1297. *G. tenera*, Don, *Prodr. Fl. Nep.* 158. *Wahlenbergia thalictrifolia*, Alph. D.C. *Prodr.* vii. 425; *Campanula thalictrifolia*, Spreng. *Cur. Post.* 77.

*Hab.* In regione alpinâ Himalayæ centralis, Nipal ! Wallich.

*Herba* ut videtur annua, spithamæa v. pedalis. *Caulis* ascendens, fructiferus robustus. *Rami* tenelli, breviusculi, foliosi. *Folia*  $\frac{1}{4}$ - $\frac{1}{2}$  unc. longa, parce v. dense pubescentia. *Pedunculus* (seu apex caulis) longe nudus, 1-3-florus. *Flores* pro ratione plantæ magni, 1-1 $\frac{1}{2}$  pollicares, pallide sordide cærulei. *Calycis* lobi  $\frac{1}{4}$ - $\frac{1}{2}$  unc. longi, acuti v. obtusi, interdum dentati. *Corolla* latitudine varia,  $\frac{2}{3}$  unc. diametr. *Fructus*  $\frac{1}{2}$  unc. longus. *Semina* ut in *C. ovata* et *subsimplici*.

10. *CODONOPSIS FÆTENS* (Hf. & T.). Pubescens, caule ascendente brevi e basi ramoso superne in pedunculum longe nudum 1-2-florum desinente, foliis parvis oppositis alternisque petiolatis pubescentibus

ovatis v. late cordatis integerrimis v. subcrenatis, calycis tubo late hemisphærico, lobis oblongis, corolla late campanulata, antheris glabris, capsula valvis 3 elongatis corneis :—an var. *C. thalictrifoliæ*?

*Hab.* In regione alpinâ Himalayæ orientalis, Sikkim, alt. 14,000–16,000 ped.! *J. D. H.* (fl. Jul.) (v. v.)

*C. thalictrifoliæ* proxima, et forsân ejus forma, sed exemplaribus nostris numerosissimis, corolla multoties latior fere longitudini æquilateralis, profundius lobata, magis coriacea.

#### Gen. IV. LEPTOCODON.

*Calycis* tubus medio ovarii adhærens, lobis 5 patentibus. *Corolla* tubuloso-campanulata, breviter 5-loba. *Stamina* 5, glandulis totidem epigynis erectis alternantia. *Ovarium* 3-loculare, ovulis placentis septis ovarii adnatis uniseriatim affixis. *Stylus* erectus. *Stigma* clavatum, 3-lobum. *Fructus* pars infra calycis lobos coriacea, obconica; pars superior elongato-conica, cornea, 3-valvis. *Semina* pauca, lineari-oblonga, testa atra, nitida, crustacea.—Herba *lactescens, tenerrima, volubilis, ramosa*; ramis *ramulisque fragillimis, gracilibus, dense intertextis*; foliis *oppositis alternisque, petiolatis, flaccidis, grosse crenato-lobatis*; pedicellis *gracillimis, plerumque extra-alaribus*; floribus *pendulis, dilute cæruleis*; calycis lobis *obovatis subdentatis*.

1. *Leptocodon gracilis*, *Hf. & T.* (Codonopsis, § *Leptocodon gracilis*, nob. in *Ill. Sikkim Himal. Plants*, t. xvi. A.)

*Hab.* In sylvis temperatis humidis Himalayæ orientalis, Sikkim! et Nepal Orient.! alt. 5000–7000 ped., *J. D. H.* (fl. Maio). (v. v.)

Planta pulcherrima, flaccida, cito evanescens, foetidissima. *Caules* ramique dense intertexti. *Folia*  $\frac{2}{3}$ –1 unc. longa, petiolo fere æquilongo, pallide viridia, subtus glauca. *Calyx* semisuperus, lobis basi remotis, parvis, patentibus, corolla pluries brevioribus. *Corolla* pollicaris, translucida, tubulosa, supra medium ampliata, limbo truncato obscure 5-lobo. *Ovarii* pars infera obscure 5-costata; pars superior paulo longior in stylum attenuata. *Stigma* late ovoideum; lobis extus dense pilosis. *Glandulæ* epigynæ lineares, carnosæ. *Pollen* globosum, muricatum. *Semina* nitida; testa crassiuscula, albumine copioso; *embryone* tecti, *cotyledonibus* parvis, *radicula* cylindracea.

#### Gen. V. CYCLOCODON, *Griff.*

*Calyx* basi ovario adhærens v. omnino liber et pedicello positus, 5-partitus, foliolis subserratis. *Corolla* breviter campanulata, 4–5-loba. *Stamina* 4–5. *Stylus* erectus. *Stigma* clavatum, 4–5-lobum, lobis demum revolutis. *Ovarium* 4–5-loculare, loculis sepalis oppositis, ovulis plurimis, placentis crassis axillaribus multi-seriatim affixis. *Fructus* baccatus, irregulariter ruptus; semina

numerosa, subangulata, compressa; testa lævi coriacea; embryone late clavato, cotyledonibus radículaque brevibus. *Herbæ tropicæ, glaberrimæ, annuæ, inodoræ, succo aqueo; caules cylindracei, di-trichotome ramosi; ramis foliisque oppositis; floribus in cymas trichotomas dispositis, parvis, albis; pedunculis curvis, cernuis.*

1. *CYCLOCODON PARVIFLORUM* (Hf. & T.). Erectum, dichotome ramosum, foliis ovato-lanceolatis longe acuminatis serratis breve petiolatis subtus glaucis, sepalis liberis, floribus tetrameris.—*C. distans*, Griff. MSS. Notul. iii. *Codonopsis parviflora*, Wall. Cat. 1300; *Alph. D.C. Mon. Camp.* 123; *A. D.C. Prodr.* vii. 423. *Campanumœa celebica*, Blume, Bijdr. 727; *Alph. D.C. Monog. et in D.C. Prodr. l. c.*

*Hab.* In Himalayâ orientali tropicâ alt. 3000–5000 ped. Sikkim! Assam! et Mont. Khasia, alt. 2000–4000 ped.! Wallich, Griffith, & Hf. & T. (fl. August. Sept.). (v. v.)—*Distr.* Ins. Celebes! Java!

*Herba* inodora, glaberrima, gracilis, glaucescens, 1–3-pedalis, e basi v. superne ramosa. *Caules* teretes ramique stricti. *Folia* patentia, 1½–4 poll. longa, anguste v. late ovato-lanceolata, grosse obtuse irregulariter serrata. *Pedicelli* simplices v. divisi, validi, apice curvi, nudi v. paucifoliati. *Flores* albi, ⅓ unc. longi, nutantes. *Calyx* nunc basi floris adnatus, sæpius a flore remotus involucriformis. *Sepala* linearia, lanceolata v. subulata, integerrima v. grosse multi- v. paucidentata, ⅓–½ poll. longa, alabastrum non cælantia. *Ovarium* pyriforme, stipitatum. *Corolla* late cylindraceo-campanulata, infra medium 4-fida, lobis latis acutis. *Filamenta* dilatata, antheris linearibus æquilonga. *Stylus* superne infundibuliformis, glaber, in ramos stigmatosos 4 patentes fissus. *Bacca* globosa, vix carnosa, ¼–½ poll. lata, basi calyce stipata, 4-locularis. *Semina* in placentis latis axillaribus multiseriata, parva, compressa, subangulata, testa lævi coriacea; *albumen* carnosogranulatum; embryo parvus, late clavatus, utrinque obtusus, cotyledonibus radículaque brevibus.

2. *CYCLOCODON TRUNCATUM* (Hf. & T.). Erectum, dichotome ramosum, foliis ovato-lanceolatis acutis grosse obtuse serratis, floribus 5-meris, sepalis medio ovarii adnatis.—*Codonopsis truncata*, Wall. Cat. 130; *Alph. D.C. Monog.* 122.

*Hab.* Pegu ad ripas Irawaddi, Wallich! Mergui! Griffith.

*C. parviflora* simillima sed major, robustior, floribus pentameris et calyce ovario adhærente, a pedunculo remoto.

Gen. VI. *CYANANTHUS*, Wall.

*Calyx* basi ovarii adhærens, 5-fidus, persistens, lobis valvatis. *Corolla* cylindracea, membranacea, marcescens, infundibuliformis v. subcampanulata, tubo calyce longiore, lobis 5 valvatis. *Stamina* 5, una cum corolla basi ovarii adhærentia, filamentis gracilibus, antheris oblongis liberis? *Ovarium* imo basi calycis adhærens,

ceterum liberum, conicum, tubo calycis æquilongum, in stylum corollæ tubo breviorē attenuatum. *Stigma* obconicum v. clavatum, extus pubescens, 3–5-lobum, lobis brevibus erectis demum recurvis. *Ovarium* 3–5-loculare, loculis basi placentiferis; ovulis plurimis placentis axillaribus adnatis. *Capsula* conica, coriacea, calyce emarcido interdum inflato tecta, apice 3–5 valvis. *Semina* plurima, parva, oblonga; testa fusca v. brunnea.

Herbæ Himalayanæ, succo aqueo (in omnibus?), annuæ v. rhizomate multicipiti brevi perenni, pubescentes v. glabratae; rhizomatis rami apice squamosi, squamis imbricatis; caulibus e ramis rhizomatis plurimis, prostratis, simplicibus, rarius divisis, speciebus annuis ramosis; foliis parvis, alternis, brevi-petiolatis, simplicibus v. lobatis, integerrimis et crenatis serratisve, subtus pallidis glaucisve, summis sæpissime florem involucrantibus; floribus plerisque speciosis, cæruleis, terminalibus, solitariis, sessilibus v. breve pedunculatis.

§ I. *Radix* perennis, caulibus simplicibus. *Corolla* ampla, limbo patente.

1. *CYANATHUS INTEGER* (Wall. Cat. 1472). Caule simpliciusculo elongato glabro, foliis elliptico- v. obovato-lanceolatis acutis supra medium serratis utrinque appresse pilosis, floribus terminalibus breve pedunculatis, calyce cylindraceo atro-villoso corollæ tubo  $\frac{1}{2}$  breviorē. —*Benth. in Royle, Ill. Pl. Him.* 309; *Walp. Rep.* vi. 388. C. barbatus, *Edgw. in Linn. Trans.* xx. 82.

*Hab.* In Himalayæ regione temperatâ et subalpinâ, alt. 10,000–12,000 ped. Kumaon! *Blinkworth, Strachey & Winterbottom.* (fl. Jul.)

*Caules* spithamæi ad pedales, graciles, prostrati apicibus ascendentibus, apicem versus puberuli, cæterum glaberrimi nitidi. *Folia* brevissime petiolata,  $\frac{1}{2}$ – $\frac{2}{3}$  unc. longa, subtus glauca, membranacea. *Flores* speciosi, erecti. *Calyx*  $\frac{1}{2}$  unc. longus, basi rotundatus, lobis ovato-lanceolatis acutis tubo æquilongis. *Corolla* pallide cærulea, anguste campanulata, glaberrima, lobis brevibus late ovatis vix acutis, glabris. *Stamina* tubo corollæ  $\frac{1}{2}$  breviorē, filamentis gracillimis; antheris oblongis. *Ovarii* pars superior elongato-conica, staminibus æquilongis, in stylum brevem angustata; stigmate capitato 5-lobo.

2. *CYANANTHUS LOBATUS* (Wall. Cat. 1473). Caule simpliciusculo elongato, foliis cuneatis spathulatisve profunde inciso-lobatis crenatisve trilobisve segmentis obtusis cuneatis, subtus parce pilosis, floribus terminalibus breve pedunculatis, calyce cylindraceo atro-villoso corollæ late infundibuliformis tubo dimidio breviorē, corollæ lobis late obovatis patentibus apice barbatis v. glaberrimis. —*Benth. in Royle, Ill.* 309; *Walp. Rep.* vi. 388.

*Hab.* In Himalayæ regione alpinâ, alt. 11,000–13,000 ped. Nepal!

*Wallich. Kumaon! Blinkworth, Edgeworth, Strachey & Winterbottom, Madden. Sikkim! J. D. H. (fl. Aug.) (v. v.)*

*Caules* subrobusti, spithamæi et ultra, plerumque plus minusve patentim pilosi, prostrati apicibus ascendentibus. *Folia* sparsa,  $\frac{3}{4}$ –1 unc. longa, latitudine varia, basi cuneata in petiolum latum angustata, 3-multi-loba, subtus glauca, marginibus sæpius sicco recurva, subtus sæpissime pilosa, rarius utrinque pilosa v. utrinque glabra. *Flores* inclinati, speciosi, eos *C. integri* æquant, sed limbo longiore latiore et magis expanso. *Pedunculus* atro-villosus. *Calyx* longitudine varius, nunc paulo longior nunc bis longior quam latus, lobis acutis  $\frac{1}{3}$  longitudine tubi. *Corollæ* limbus explanatus, laciniis apice glabris pilisve raris barbatis; tubus glaberrimus. *Stamina* et *ovarium* ut in *C. integro*; stigmatibus subclavato 4-lobis. *Capsula* calycis tubo æquilonga, apice breviter 4-5-valvis. *Semina* lineari-oblonga, testa fusca.

3. *CYANANTHUS LINIFOLIUS* (Wall.). Caulibus e rhizomate crasso plurimis ascendentibus foliisque pubescenti-pilosis glabrativis, foliis brevibus lineari-oblongis subacutis obscure crenato-serratis marginibus recurvis, floribus terminalibus breve v. longe pedunculatis, calyce cylindraceo atro-villoso corollæ tubo  $\frac{1}{2}$ – $\frac{2}{3}$  brevior lobis lanceolatis acutis, corolla infundibuliformi-campanulata fauce villosa lobis apice acutis pilosulis rarius glaberrimis.—*C. microphyllus!* Edgw. in Linn. Trans. xx. 81.

*Hab.* In Himalayæ regione alpinâ, alt. 10,000–16,000 ped.! *Wall.*; Kumaon! *Edgeworth, Strachey & Winterbottom*; Sikkim! *J. D. H. (fl. Aug. Sept.) (v. v.)*

*Rhizoma* breve, crassum, multiceps, perenne. *Caules* perplurimi, graciles, prostrati demum ascendentes, 4 unc. ad spithamæum, basi squamis brevibus ovato-lanceolatis nitidis  $\frac{1}{4}$  unc. longis imbricatis circumdati. *Folia*  $\frac{1}{4}$ – $\frac{2}{3}$  unc. longa, subtus glauca, plerumque utrinque pubescentia, rarius glabra. *Flores* speciosi, *C. integro* similes sed calyce plerumque brevior lobisque corollæ paulo longioribus. *Calycis* lobi ovato-lanceolati. *Corolla* pollicaris, fauce tuboque dense v. laxè villosa v. glaberrima, lobis apice laxè ciliatis nudisve. *Ovaria* et *stamina* exacte cum *C. integro* quadrant; *stigma* subclavato 4-5-lobis, lobis recurvis. *Capsula* calyce æquilonga, 4-5-valvis. *Semina* parva, oblonga, brunnea.

4. *CYANANTHUS INCANUS* (Hf. & T.). Caulibus e rhizomate crasso plurimis brevibus ascendentibus foliisque utrinque dense incano tomentosis, foliis brevibus ovatis ellipticis lanceolatisve marginibus obscure sinuato-crenatis recurvis, floribus terminalibus, calyce breviter cylindraceo incano v. fusco-tomentoso lobis brevibus, corolla calyce triplo longiore lobis oblongis fauce dense villosa.

*Hab.* In Himalayæ orientalis regione alpinâ, Sikkim, alt. 12,000–16,000 ped.! *J. D. H. (fl. July, Aug.) (v. v.)*

*C. linifolio* affinis sed minor, caulibus interdum ramosis foliisque dense tomentosis. *Rhizoma* crassum, multiceps. *Caules* basi squamis



cincti, pilis patulis. *Folia* forma varia, subconferta,  $\frac{1}{4}$  unc. longa. *Flores* sessiles v. pedunculati, suberecti, vix pollicares. *Calyx* breviusculus, pallidus, pilis subappressis, fructiferus paulo inflatus. *Ovarium* calyci æquilongum; stylo longiore quam in præcedentibus; stigmatem *C. linifolii*. *Capsula* conica, calyci basi turgido æquilonga. *Semina* minima, oblonga, fusca.

§ II. *Annuæ*, caulibus ramosis. *Corolla* cylindræa, limbo non patente.

5. *CYANANTHUS INFLATUS* (Hf. & T.). Annuus, caulibus prostratis filiformibus ramosis patentim pilosis, foliis sparsis petiolatis rotundatis sinuato-dentatis crenatisve supremis subinvolutantibus, calyce obovato breviter 5-dentato patentim fusco-villoso, corolla cylindræa brevissime 5-loba, capsulæ valvis ultra calycem inflatum globosum porrectis.

*Hab.* In Himalayæ orientalis regione alpinâ, alt. 11,000–16,000 ped. Bhotan! Griffith (1771); Sikkim! et Nepaliâ! orientalis, J. D. H. (fl. August.) (v. v.)

*Herba* statura variabilis, 2 unc. ad bipedalem! *Caules* prostrati, divaricatim ramosi, flexuosi, rigidi, ramosi, parce foliati. *Folia* sparsa, parva,  $\frac{1}{4}$  unc. longa, 2 summa flori approximata. *Flores* suberecti,  $\frac{1}{3}$ – $\frac{1}{2}$  unc. longi, cærulei, sessiles v. pedunculati. *Calyx* basi turgidus, corollæ dimidio brevior; fructifer  $\frac{1}{4}$ – $\frac{2}{3}$  unc. diametro. *Corollæ* lobi brevissimi, erecti. *Ovarium* calyce longius; stylo brevi; stigmatem obconico 5-lobato. *Capsula* late conica, valvis 5 exsertis recurvis acuminatis. *Semina* minima, oblonga, fusca.

6. *CYANANTHUS* (*sp. nov.* sed exemplaria manca). *Annuæ*, *Cerastoidea*, caulibus rigidius ramosis multifloris 2–4-pollicaribus, foliis parvis petiolatis ovatis, calycibus fructiferis parvis oblongis longe laxè villosis breviter 5-dentatis, capsulæ valvis 3–5 erectis subexsertis.

*Hab.* In Himalayæ regione alpinâ Nepaliæ orientalis, alt. 13,000 ped. J. D. H. (v. fr. v.)

## Gen. VII. WAHLENBERGIA.

1. *WAHLENBERGIA AGRESTIS*, A. D. C. (*Wight, Icon.* t. 1175). W. dehiscens, A. D. C. W. Indica, A. D. C. (*Wight, Icon.* t. 1176). Confer quoque W. gracilis, A. D. C., ex Australia; W. quadrifida, A. D. C., ex Australia; W. multicaulis, A. D. C., ex Australia; W. Sieberi, A. D. C., ex Australia; W. marginata, A. D. C., ex Japan; W. lavandulæfolia, A. D. C., ex Java; W. silenoides, Hochst., ex Abyssinia. Species pleræque variabiles, valde affines, et si vere distinctæ vix characteribus propositis certe distinguendæ.

*Hab.* Per totam Indiam orientalem tropicam et subtropicam, arvis, locis sterilibus pinguibusque vulgatissima, a Ceyloniâ! ad Garwhal! (fl. per totum annum) (v. v.).—*Distr.* Chinâ, Africâ orientali? et australi?, et in Australiâ?

2. *Wahlenbergia peduncularis*, A. D.C. (sub *Campanula peduncularis*, Wall. in Prodr. viii. 483).

*Hab.* In Himalayæ orientalis provincia Kumaon! alt. 6000–7000 ped. *Blinkworth*, *Strachey & Winterbottom*, &c. (fl. temp. calid.).

Vera *Wahlenbergia* est ut rite conjicitur cl. A. DeCandolle. *Corolla* fere ad basin 5-loba; lobis vix æqualibus. *Capsulæ* pars superior conica, 3-valvis. *Stigmata* 3, revoluta. *Stamina* libera. *Anthera* lineari-oblonga, filamento infra medium dilatato ciliato  $\frac{1}{2}$  brevior.

### Gen. VIII. CAMPANULA, L.

1. CAMPANULA (§ Medium) GRIFFITHII (*Hf. & T.*). Hispido-pilosa, caulibus e radice crassa plurimis suberectis dichotomis subramosis rigidis pallidis nitidis, foliis ( $\frac{1}{3}$  pollicaribus) subsessilibus oblongo-lanceolatis dentatis utrinque hispido-pilosis, floribus subpaniculatis breve pedunculatis, calycis strigoso-hispidi tubo brevi lobis oblongo-ovatis sinubus breviter deflexis, corolla late campanulata pilosa, stylo elongato exserto, stigmatibus 2–3, capsula fere supera.

*Hab.* Affghanistan! *Griffith*, 695; Beloochistan! fissuris rupium frequens, *Stocks*, 954.

*Radix* lignosus. *Caules* perplurimi, 6 unc. ad spitham., suberecti, teretiusculi, pilis reflexis sparse hispidi, uti tota planta pallidi, fragiles. *Folia* grisea, argute dentata v. subintegerrima, ciliata, superne strigosa. *Flores* nutantes sub  $\frac{1}{2}$  unc. longi. *Calycis* appendices longitudine variæ lobis corollæ  $\frac{1}{2}$  breviores, ciliatæ. *Corolla* basi inflata, lobis ovato-lanceolatis. *Stylus* corollâ duplo longior. *Capsulæ* pars infra limbum calycis hispida, brevis, late turbinata; pars superior corolla persistente tecta, subhemisphærica. *Semina* minima, lineari-oblonga, pallide brunnea.

2. *Campanula latifolia*, L.

*Hab.* In Himalayâ centrali et occidentali temperatâ, alt. 7000–11,000 ped. Nepal! *Wallich*; Kumaon! *Blinkworth*, &c.; Simla, *Edgeworth*, &c.; Kashmir! (fl. Aug.) (v. v.)—*Distr.* Europa borealis et australis; in montibus Caucasi et Persiæ borealis.

3. *Campanula sylvatica*, Wall.

*Hab.* Regione temperatâ Himalayæ, alt. 5000–9000 ped. Bhotan! *Griffith*; Nepal! *Wallich*; Kumaon! *Strachey & Winterbottom*, &c. (fl. temp. calid.) (v. v.)

4. CAMPANULA (EUCODON) CANA, Wall. Tota dense cano-tomentosa, caulibus diffusis ramosis rarius teretibus subflexuosis, foliis ( $\frac{1}{2}$ – $\frac{3}{4}$  poll.) subsessilibus ellipticis ovato-lanceolatisve subacutis utrinque albidis subtus obscure venosis crenatis integerrimisve, floribus (magnis) ad apices ramulorum paucis nutantibus, calycis cani tubo brevissimo lobis triangulari-ovatis integerrimis acuminatis corolla ter brevioribus, corollæ campanulatæ pubescentis lobis brevibus, stylo gracili, stigmatibus 3 brevibus inclusis.

Var. *α*. Caule ramisque villosis pilis sericeis subpatulis, foliis crenatis.

Var. *β*. Caule ramisque tomentosius robustis, foliis crenatis.

*Hab.* Montibus temperatis Himalayæ: var. *α*. Nepal! *Wallich*; Kumaon! *Strachey & Winterbottom*; Garwhal, 6000 ped.! *Edgeworth*; Simla, alt. 7000–8000 ped.! *T. Thomson*. (fl. Aug.) (v. v.)

Var. *β*. Bhotan! *Griff.* 2208. (fl. Sept. Oct.) (v. v.)

Species pulcherrima, *C. coloratæ*, var. *γ*, affinis, ubique pube nivea plus minusve tomentosa v. villosa vestita, floribusque magnis cæruleis conspicua. *Caules* 4–6 unc. longi, parce divaricatim ramosi, teretes, sicco subfragiles. *Folia* sparsa, rarius conferta, patula, plana v. rarius marginibus recurvis,  $\frac{1}{3}$ – $\frac{2}{3}$  unc. longa, obtusa, venis subtus crassis prominentibus. *Flores* breve pedicellati, pedicellis curvis. *Corolla* exemplaribus Kashmiricis fere pollicaris, pubescenti-pilosa. *Filamenta* basi latissima fimbriata, superne filiformia. *Ovarium* fere superum; pars superior late hemisphærica in styli basin abrupte attenuata, glaberrima. *Capsula* breviter obconica, valvis basilaribus.

##### 5. *Campanula canescens*, Wall.

*Hab.* Afghanistan, *Griffith*. Planitie Panjab! Bengalix superioris! et orientalis! necnon convallibus tropicis Khasia! et Himalayæ! ad 6000 ped. ascendens, arvis et ruderalis vulgaris. (fl. per totum annum.) (v. v.)

Flores dimorphi, alii normales, alii minimi corolla et staminibus destituti.

##### 6. *Campanula colorata*, Wall. — cf. *C. pallida*, Wall.; sequentes varietates habendas nobis videtur.

*β. Moorcroftiana*, calycis lobis angustis.

*γ. ramulosa*, calycis lobis subdentatis. *C. ramulosa*, Wall., Wight, Icon. 1178. *C. nervosa*, Royle! Ill. 253, sine descr.

*δ. Tibetica*; minor, collo multicipiti, ramis scaberulo-pubescentibus diffusis 3–6-pollicaribus, foliis elliptico-ovatis subdentatis, lobis calycinis late triangularibus; floribus sæpius dimorphis.

*ε. anomala*; calycis lobis sinibus subreflexis, cæterum *δ. Tibetica*.

*Hab.* In Himalayâ temperatâ, alt. 5000–6000 ped. (fl. æstate.)

var. *α*. Nepal! *Wallich*; Kumaon! *Strachey & Winterbottom*, &c.; Simla! *Edgeworth*, &c.; Kashmir! (v. v.)

var. *β*. Kumaon! Simla! Kunawur! Kashmir! Tibetiâ occidentali! et Afghanistan! *Griffith*. (v. v.)

var. *γ*. Montibus Khasia 5000–6000 ped.!, *Lobb*, &c.; Nilghiri! *Wight*, &c.; Sikkin, alt. 6000–10,000 ped.!, Nepal, *Wallich*; Kumaon! *Strachey & Winterbottom*. (v. v.)

var. *δ*. In Tibetiâ occidentali Zanskar!, Kashmir!, &c., alt. 8000–12,000 ped. (v. v.)

var. *ε*. In Tibetiæ occidentalis regione temperatâ; Nubra, alt. 12,000 ped.!, *T. T.* (fl. Aug.) (v. v.)

7. *Campanula Alphonsii*, Wall. Wight, Spicil. ii. 22. t. 125. Icon. 1177.  
—an forma *C. canæ*, Wall.?

*Hab.* Montibus Nilghiri regione temperatâ, alt. 7000–8000 ped. ! *Wight*, &c. (fl. æstate.)

8. *Campanula Kashmiriana*, Royle.

var.  $\beta$ . *evolvulacea* (Royle), minor, caulibus laxioribus tenuioribus diffusis, floribus minoribus.

*Hab.* In Himalayæ et Tibetiæ occidentalis regione temperatâ, alt. 6000–13,000 ped. ; Garwhal ! *Strachey & Winterbottom*, &c. ; Kunawur ! Kishtwar ! Kashmir ! &c. (fl. æstate.) (v. v.)

Planta polymorpha, floribus dimorphis, aliis speciosis iis *C. coloratæ* subsimilibus (iconi Roylei congruentibus), aliis axillaribus longe gracile pedunculatis minimis, corolla et staminibus orbatis. *Flores* erecti v. nutantes. *Calycis* laciniae interdum sinubus basi subreflexis ut in § *Medium*.

9. *CAMPANULA ALSINOIDES* (Hf. & T.). An forma apetala *C. coloratæ* var. *Tibeticæ*? patentim pubescenti-pilosa, ramis gracillimis prostratis filiformibus ramosis, foliis membranaceis oblongo-ovatis in petiolum angustatis subacutis obscure dentatis, pedicellis terminalibus axillaribusque elongatis filiformibus, calycis tubo globoso lacinii lanceolatis irregularibus integerrimis dentatisve.

*Hab.* In Himalayæ occidentalis provinciis Kunawur superiore ! ; Kishtwar ! et in Tibetiâ occidentali ! alt. 7000–10,000 ped. (fl. æstate.) (v. v.)

*Radix* perennis, lignosa. Rami v. caules perplurimi, uti tota planta pilis brevibus patentibus hispiduli, 4–8 unc. longi, flexuosi. *Folia*  $\frac{1}{3}$ –1 unc. longa, læte viridia. *Pedunculi*  $\frac{1}{2}$ –1 unc. longi. *Flores* nutantes. *Corolla* et stamina non visa. *Capsula* globosa,  $1\frac{1}{2}$  lin. diametro, membranacea, pubescens, basi poris dehiscens. *Semina* minima, lenticularia, pallida, nitida.—A forma apetala *C. Kashmirianæ* differt pilis elongatis patulis, foliis non canis, et calycis laciniiis majoribus herbaceis.

10. *Campanula argyrotricha*, Wall. (Flores dimorphi.)

*Hab.* In Himalayâ occidentali temperatâ, alt. 8000–12,000 ped. Kumaon ! *Blinkworth*, &c. ; Garwhal ! *Strachey & Winterbottom* ; Simla ! (fl. æstate.) (v. v.)

11. *Campanula fulgens*, Wall. ; Wight, Icon. t. 1179 ; Illustr. t. 136.

*Hab.* In montibus subtropicis, alt. 4000–6000 ped., Khasiæ ! Himalayæ centralis ! et orientalis ! (Nepal et Sikkim) ; Peninsulæ mont. Nilghiri ! et Canaræ !, necnon in insulâ Ceylon ! (fl. æstate.) (v. v.)

12. *Campanula aristata*, Wall.

*Hab.* In regione alpinâ Himalayæ. Sikkim ! alt. 12,000–16,000 ped. ; Nepal ! *Wallich* ; Zanskar et Tibetiâ occidentali, alt. 13,000–14,000 ped. ! *Strachey & Winterbottom*, &c. (fl. August.) (v. v.)

13. *CAMPANULA (EUCODON) MODESTA* (Hf. & T.). Pumila, glaberrima, uniflora, caule flexuoso simplici, foliis radicalibus petiolatis obovato-

oblongis rotundatisve, caulinis lineari-lanceolatis, flore nutante, calycis tubo lineari-clavato glaberrimo laciniis subulatis corolla campanulata breviter 5-loba  $\frac{1}{2}$  brevior, stigmatibus 3 revolutis, capsula erecta obconica prismatica apice contracta, pedunculo apice incrassato alato torto.

*Hab.* In regione alpinâ Himalayæ orientalis, prov. Sikkim, alt. 11,000–14,000 ped. ! (fl. Aug.) (v. v.)

*C. aristata* Wall. affinis, differt statura humiliore, robustiore, calycis laciniis multoties brevioribus, et præcipue forma capsulæ. Herba 3–4-pollicaris, caule tereti striato, foliis radicalibus  $\frac{1}{4}$  unc. latis, caulinis  $\frac{1}{2}$  unc. longis. Flores parvi. Calycis tubus 2 lin. longus. Corolla cærulea, 2–4 lin. longa. Anthera linearis apiculata, filamentum lineari-glaberrimo paulo longior et latior. Stigmata 3 revoluta. Capsula coriacea, pyriformis, profunde sulcata, lateraliter dehiscens, nitida, sæpe atra,  $\frac{1}{2}$  unc. longa. Semina minima, lenticularia, nitida.

14. CAMPANULA (EUCODON) KHASIANA (Hf. & T.). Hispidulo-pubes-cens, caule simplici erecto stricto subrobusto sulcato, foliis suberectis sessilibus obovato-oblongis acuminatis serratis utrinque hispidulo-pubescentibus subtus reticulatim venosis, racemo elongato terminali simplici v. paniculatim ramoso, floribus mediocribus nutantibus breve pedicellatis pedicellis bracteatis, calycis tubo subgloboso lobis setaceo-lanceolatis serratis corolla glabra ampla campanulata breviter 5-loba  $\frac{1}{2}$  brevioribus, stylo gracili subexserto, stigmatibus 2 brevibus.

*Hab.* Montibus Khasia graminosis regionis temperatæ, alt. 5000–6000 ped. ! Griffith, Lobb, &c. (fl. July.) (v. v.)

Species pallidior, 1–3 pedalis. Caulis basi crass. pennæ anserinæ. Folia  $1\frac{1}{2}$ –3 unc. longa. Flores numerosi, remoti. Calyx glaber. Bracteæ anguste lanceolatæ, serratæ. Corolla  $\frac{3}{4}$  unc. longa, e basi ad faucem sensim ampliata hinc subinfundibuliformi-campanulata, interdum 6–8-loba. Filamenta basi dilatata pilis copiosis ciliata, superne filiformia.

*C. rapunculoidi* habitu et staturâ similis.

15. CAMPANULA (EUCODON) THOMSONII (Hf.). Glaberrima v. inferne puberula, caule erecto subramoso gracili ramisque subangulatis, foliis (radicalibus subnullis) gracili-petiolatis ovatis ovato-cordatisve acutis v. apice attenuatis subserratis tenuiter membranaceis, floribus (inter minoribus) ramulis elongatis gracilibus laxè paniculatis pedicellatis erectis, calycis tubo glaberrimo breviter turbinato segmentis bracteo-lisque ad basin pedicellorum setaceis, corolla late campanulata profunde 5-fida tubo segmentis calycis brevior segmentis elongatis patentibus lineari-oblongis, stylo crassiusculo longo clavato, stigmatibus 2 brevibus.

*Hab.* In Himalayæ occidentalis sylvis temperatis in prov. Jamu, alt. 6000–7000 ped. ! (fl. April.) (v. v.)

Radix lignosa, perennis. Herba gracilis, tenera, plerumque glaberrima, parce ramosa, spithamæa ad bipedalem. Folia infima interdum ob-

ovata, cætera omnia inter se conformia v. suprema angustiora, omnia 1-2 unc. longa in petiolum gracilem superne alatum abrupte angustata, sicco translucida, irregulariter serrata, basi sæpe inæquilateralia. *Panicula* simplex v. ramosa, 6-8-flora, rarius 20-40-flora. *Pedicelli* graciles. *Calycis* tubus 1-2 lin. longus, subglobosus, profunde sulcatus; segmentis 2-4 lin. longis. *Corolla* alba? sub  $\frac{1}{2}$  unc. lata. *Filamenta* brevia, basi dilatata, ciliata; *antheræ* lineari-elongatæ post anthesin tortæ. *Styli* pars pilosa elongata columnaris.

*Campanula anagalloides*, Royle (Ill. 254 sine descript.), est *Cephalostigma hirsutum*, Edgew.

### Gen. IX. PERACARPA, Hf. & T.

*Calycis* tubus obconicus, limbi lobis triangularibus. *Corolla* campanulata, profunde 5-loba, lobis æqualibus linearibus acuminatis. *Stamina* epigyna, filamentis linearibus liberis; antheris linearibus. *Stylus* elongatus, stigmatibus 3 revolutis. *Ovarium* 3-loculare. *Capsula* oblonga, pendula, tenuiter membranacea, apice contracta, oligosperma, irregulariter rupta. *Semina* magna, oblonga, testa coriacea.—Herba *debilis, ramosa, tenella, carnosula, prostrata v. repens, glaberrima*; foliis *petiolatis, ovatis, subacutis, sinuato-dentatis, pollicaribus*; pedicellis *axillaribus, gracilibus, erectis*; floribus *parvis, albis*; capsula *pendula, torulosa* (nomen  $\epsilon\ \pi\eta\rho\alpha$  *saccus* et  $\kappa\alpha\rho\acute{o}s$ ).

1. *Peracarpa carnosula*, Hf. & T.—*Campanula carnosula*, Wall. Cat. 1282, et in Roxb. Flor. Ind. ii. 102; A. D.C. Prod. vii. 474.

*Hab.* In sylvis humidis regionis temperatæ Himalayæ centralis! et orientalis! alt. 6000-10,000 ped., Nepal! Kumaon! *Strachey & Winterbottom, Wallich*; Sikkim! necnon in Mont. Khasia, alt. 5000-6000 ped.! (fl. Jul.) (v. v.)

### Gen. X. PENTAPHRAGMA, Wall.

1. *Pentaphragma begoniæfolium*, Wall.

*Hab.* In Peninsulâ Malayanâ, ad Penang! *Wallich*; Singapore! *Lobb* et *Mergui*! *Griffith*. (fl. ?)

Quid *Symphyandra stylosa*, Royle, e Himalaya occidentali!

## Tribe II. LOBELIÆ.

### Gen. XI. PIDDINGTONIA, D.C.

1. *Piddingtonia nummularia*, Lamk.

*Hab.* In montibus subtropicis Khasiæ et Himalayæ orientalis et centralis; alt. 4000-7000 ped. frequens (fl. temp. pluv.) (v. v.).—*Distr.* Java! et China!

## \* ISOLOBUS.

\* *Isolobus Roxburghianus*, D.C. ; an *Lobelia cæspitosa*, Blum.?

*Hab.* In horto botanico Calcuttensi ! versosimiliter e China introducta.

In hortis Anglicis mont. Khasiæ, alt. 4000 ped. ! (v. v.) (fl. August.)

—*Dist.* Java ! et China !

Gen. XII. SPEIREMA, *Hf. & T.*

*Calycis* tubus globosus, limbi lobis lineari-subulatis, patentibus revolutisve. *Corolla* dorso ad basin fissa, bilabiata, labio superiore inferiore longiore lobis 2 linearibus acuminatis, inferiore subspathulato trilobo lobis lanceolatis acuminato-caudatis. *Antheræ* marginibus pilosis, 2 inferiores apice penicillatæ. *Fructus* globosus, subcarnosus, irregulariter ruptus, 2-locularis. *Semina* numerosissima, testa lævi coriacea.—Herba *elata*, *glaberrima*, *divaricatin* *ramosa* ; *ramis pedilibus gracilibus prostratis* ; *foliis* 2-4-pollicaribus subdistichis secundisve, *petiolatis*, *ovato-lanceolatis*, *longe acuminatis*, *irregulariter subduplicato-serratis* ; *pedunculis* 1-2-pollicaribus, *solitariis*, *axillaribus*, *1-floris*, *elongatis* ; *floribus suberectis*, *luride purpureis* ; *corolla sub*  $\frac{2}{3}$  *unc. longa*, *intus parce pilosa*, *calycis lobis angustissimis longiore* ; *bacca globosa*, *membranacea v. subcarnosa*. (Nomen *σπείρημα*, *spira*, ad calycis lacinias apice revolutas refert.)

1. *Speirema montanum*, *Hf. & T.*—*Lobelia montana*, *Blume*, *Bijd.* 728 ; *A. D.C. Prodr.* vii. 387.

*Hab.* In Sylvis Himalayæ regionis temperatæ provinciæ Sikkim, alt. 5000–7000 ped. ! (fl. temp. pluv.) (v. v.)—*Distr.* Montibus Javæ !

*Stirps* Javanica ab Himalaica nullo modo differt.

## Gen. XIII. LOBELIA.

1. *Lobelia trigona*, *Roxb.* (*Antheræ omnes apice penicillatæ*), cf. *L. Zeylanica*, *Linn.* ; *L. trialata*, *Ham.* ; *L. micrantha*, *Hook.* ; *L. Reinwardtiana*, *D.C.* ? *L. subincisa*, *Wall.*

Variat insigniter staturâ, caule crassiusculo v. gracili, erecto ramoso v. prostrato, foliis subsessilibus v. petiolatis, oblongis ovatis cordato-ovatisve, floribus axillaribus v. in paniculas terminales dispositis, corolla læte cærulea v. purpurea interdum saturate azurea.—An species 2 hic confusæ diutius inquirendæ ?

*Hab.* Per totam Indiam (præcipue oryzetis) vulgatissima, a Birma ! et Peninsula Malayana ! usque ad Simla ! in montibus Himalayæ crescit ad 6000 ped. ! (fl. per totum annum) (v. v.)—*Distr.* China ! Java !

2. *Lobelia affinis*, *Wall.* ; cf. *L. succulenta*, *Blume*.

*Hab.* In Ceyloniâ ! *Walker*, *Gardner*, *Thwaites* (C. P. cum 1776 et 2981 mixta) et Peninsulâ Malayanâ ad Malacca ! *Lobb* ; in Bengaliâ orientali ! et montibus subtropicis Himalayæ orientalis ! (Sikkim !) et

montibus Khasiæ ad ped. 7000 ascendens haud infrequens! (fl. temp. pluv.) (v. v.)—*Distr.* China! Java!

Herba variabilis, cum *L. trigonâ* et *Piddingtoniâ* sæpe confusa.

3. *LOBELIA LOBBIANA* (Hf. & T.). Caule decumbente v. prostrato ramoso glaberrimo debili, ramulis puberulis, foliis petiolatis ovatis acutis argute serrulatis glaberrimis v. petiolo et costa puberulis, floribus axillaribus solitariis longe pedicellatis, pedicellis gracilibus folio æquilongis, calycis tubo puberulo lobis lineari setaceis patulis v. recurvis, corollæ tubo duro ad basin fissio breviter bilabiato labio inferiore trifido lobis oblongo-lanceolatis lateralibus subsimilibus, antheris glabris 2 inferioribus apice penicellatis.

*Hab.* Mont. Khasiâ! *Lobb.*

Species habitu et foliis *L. affinis* sed major, foliis 1-2-pollicaribus membranaceis, pedicellis valde elongatis gracilibusque, floribus triplo majoribus et tubo corollæ triplo longiore. *Calycis* lobi  $\frac{1}{3}$  unc. longi, iis *Speirematis montani* subsimiles. *Corolla* fere  $\frac{1}{2}$  unc. longa, tubo labiis duplo longiore.

4. *LOBELIA GRIFFITHII* (Hf. & T.). Pusilla, subaphylla, erecta, glaberrima, caule tenui simplici v. diviso, foliis squamæformibus distantibus erectis lanceolatis acuminatis, floribus parvis erectis v. inclinatis gracile pedicellatis caulem ramosve terminantibus, calycis tubo ovoideo lobis lanceolatis æquilongis, corollæ glabræ labro superiore inferiore brevior lobis acuminatis inferiore late trifido lobis brevibus acuminatis, staminibus glaberrimis, antheris omnibus apice penicillatis.

*Hab.* Peninsulâ Malayanâ ad Mergui! *Griffith.*

Species singularis, *L. trigonæ* affinis, *L. exili*, Hochst. Abyssiniæ similima. *Caulis* 2-9 uncialis, e basi ad apicem sensim attenuatus, subsucculentus? simplex v. si divisus ramis erectis. *Folia* 1-1 $\frac{1}{2}$  lin. longa, alterna. *Flores* cærulei, 1 lin. longi. *Calycis* lobi tubo subæquilongi, corolla  $\frac{1}{2}$  breviores.

5. *Lobelia colorata*, Wall. ; Wight, Icon. 1179.

*Hab.* Collibus siccis montium Khasiæ, regione temperatâ, alt. 5000-6000 ped.! *De Silva* ; *Lobb.* (fl. August.)

6. *LOBELIA ERECTA* (Hf. & T.). Puberula v. glabrata 2-6-pedalis, caule striato erecto virgato subsimplici tereti puberulo folioso, foliis ellipticis elliptico-lanceolatisve obtusis obscure sinuato-dentatis, racemis strictis elongatis simplicibus basi foliosis, floribus brevi-pedicellatis, calycis tubo pubescente globoso laciniis lanceolatis subdentatis tubo corollæ pubescente  $\frac{1}{2}$  brevioribus, corollæ labii superioris laciniis linearibus inferioris trifidi laciniis ovatis acuminatis, antheris glabris 2 inferioribus apice penicillatis.

*Hab.* Himalayæ orientalis regione temperatâ, Sikkim, alt. 9000-13,000 ped.! (fl. August.) (v. v.)



*Herba* erecta, caule subrobusto. *Folia* 2–3 unc. longa, subsessilia v. in petiolum breviusculum augustata. *Flores* numerosi, bracteati; bracteæ inferiores foliaceæ, superiores calycem superantes. *Pedicelli* 2–3 lin. longi, fructiferi elongati. *Corolla* sub.  $\frac{1}{2}$  unc. longa, sordide cærulca, labio superiore longiore, tubo intus piloso. *Capsula* membranacea, globosa, fere  $\frac{1}{2}$  unc. diametro, apice 2 valvis. *Semina* numerosissima, lenticularia.

*L. coloratæ* etc. affinis, differt conspicue caule simplici et calycis lobis brevibus.

7. *Lobelia pyramidalis*, Wall. Cat. 1302. ex parte—(antheræ glabræ).

*Hab.* In regionibus temperatis montium Khasiæ! et Himalayæ centralis et orientalis, alt. 5000–9000 ped.! Sikkim! Nepal! Kumaon! et Garwhal! *Wallich*, &c. (fl. temp. pluv.) (v. v.)

8. *Lobelia Wallichiana*, Hf. & T. (antheræ pilosæ et ciliatæ). *Rapuntium Wallichianum*, Presl. *L. pyramidalis*  $\beta$ , D.C.

*Hab.* In regionibus subtropicis montium Khasiæ! et Himalayæ centralis et orientalis a Sikkim! ad Kumaon! alt. 4000–7000 ped.! *Wallich* &c. (fl. temp. pluv.) (v. v.)

9. *Lobelia excelsa*, Leschenault (Wight, Ic. t. 1173, 1174).

*Hab.* Montibus Ceyloniæ! et Nilghiri! frequens (fl. temp. pluv.).

10. *Lobelia nicotianæfolia*, Heyne (Wight, Ill. t. 135); an forma *L. excelsa*?

*Hab.* Montibus Peninsulæ Nilghiri! et Canara! frequens montibus Ceyloniæ!

11. *Lobelia aromatica*, Moon; (Wight, Ic. 1172). “Media inter *L. nicotianæfoliam* et *L. excelsam*,” Wight, l. c.;—mera varietas *L. nicotianæfoliæ* nobis videtur.

*Hab.* Regione temperatâ insulæ Ceylon!

12. *Lobelia rosea*, Wall.—*L. trichandra*, Wight, Ic. 1171.—*L. pyramidalis*? Hohen. Plant. Nilgh. 1367.

*Hab.* In Himalayæ centralis et orientalis regione subtropicâ Nepal!

*Wallich*; Sikkim, alt. 3500 ped.! *J. D. H.*; montibus Khasiâ!

*Domina Mack*; montibus Nilghiri! *Wight*, &c. (fl. Jan. April.) (v. v.)

Inter *L. nicotianæfoliam* et *Wallichianam* media. Cl. Wight descripsit varietatem antheris glabris.

*L. chenopodifolia* et *L. incisa*, Wall. sunt *L. cliffortioides*, Linn.

Species nobis incognitæ:—

*L. arenarioides*, Wall.

*L. Sebæ*, D.C.

*L.?* *pumila*, Burm.

Memorandum on the Principles of Generic Nomenclature in Botany, as referred to in the preceding Paper. Drawn up by G. BENTHAM, Esq., F.L.S.

[Read March 3rd, 1857.]

Two of the chief objects of the systematist in botany are, first, to collect plants into natural groups of successively higher value and greater scope according to their mutual affinities; and, secondly, to fix upon certain stages of these successive groups to which names should be attached for the purpose of reference. It is to the latter of these objects that we would now chiefly direct our attention.

The grand object accomplished by Linnæus in his nomenclature was to create a language by which plants could be spoken of, and by means of which groups of species (called *genera*) could be referred to, classed and treated of as easily as the species themselves.

He accordingly, treating his genera as *entities* (to use a word of Jeremy Bentham's) as natural as species, distributed them for practical purposes into his well-known artificial Classes and Orders.

The evident facilities for scientific study afforded by this grouping of species into natural genera, prompted Jussieu to carry the principle much higher; and, whilst he retained Linnean genera as the basis of botanical language, he established, for the purposes of science, his *natural orders* or groups of genera, which are in fact nothing more than genera of a higher grade, and he distributed these orders or large genera into classes and subclasses.

This system of—

Species grouped into natural genera,  
Genera grouped into natural orders, and  
Orders arranged in classes more or less natural;

with a language of—

Substantive names for the genera,  
Adjective adjuncts for the species, and  
Substantively taken adjectives for the orders,

has been ever since universally followed in theory, but has been most inconveniently departed from in practice.

With the great increase in the number of species known, and the increased facilities for the study of affinities afforded by the

Linnean language and the Jussieuan principles, botanists became aware that the species of a genus and the genera of an order could be collected into intermediate groups as natural and as well defined as the genera and orders themselves, and that names were, for scientific purposes, as useful for these subordinate groups as for those genera or orders.

To carry this into practice two different courses have been adopted:—

1. To maintain the original genera and orders in their integrity (except where a mistaken view of their affinities required them to be remodelled), calling the lower groups formed for scientific purposes *subgenera*, *sections*, *subsections*, *divisions*, &c., or *suborders*, *tribes*, *subtribes*, *divisions*, &c., as the case may be;—to maintain the original names for the purposes of language;—and, for the purposes of science, to give to the subordinate groups substantive or substantively taken adjective names as the case may be, whenever these subordinate groups are so well defined or so natural, that, *but for the convenience of language*, they might have made good genera or orders;—and, when these subordinate groups are less defined or less natural, either to give them no names at all, distinguishing them by figures or signs such as \*, \*\*, &c., or §1, §2, &c., or to give them mere adjective names.

Or 2ndly. To consider even the lowest of these intermediate groups between species and original genera, or between genera and original orders, as so many independent genera or orders, with their corresponding substantive or substantively taken adjective names expected to be introduced into ordinary botanical language.

The first of these courses appears to be the only one which can save botanical nomenclature from replunging into the chaos in which Linnæus found it. It was strongly advocated by the elder De Candolle; although in the latter years of his life, seeing how general was the disposition to convert his subgenera and sections into genera, and his suborders and tribes into orders, he himself more or less gave in to the general practice. The same principle was adopted by Endlicher, but he again was disposed to go too far in giving substantive names to purely technical or ill-defined subsections of genera.

The second course is that which is now unfortunately but too general. Independently of a natural pride we all feel in establishing new genera or orders, it is felt how useful it is, in the study of affinities, to define correctly and give names to all natural groups of every grade, however numerous they may be, and how easy it

is, in the immense variety of language, to coin these names indefinitely; but it is not perceived that in attempting to introduce them all into ordinary botanical language, the memory is taxed beyond the capabilities of any mind, and the original and legitimate object of the Linnean nomenclature is wholly lost sight of. In a purely scientific point of view it matters little if the orders are converted into classes or alliances, the genera into orders, and the sections and subsections into genera; their relative importance does not depend on the names given to them, but on their height in the scale of comprehensiveness; but, for language, the great implement, without which science cannot work, it is of the greatest importance that the groups which give their substantive names to every species they include should remain large. If, independently of the inevitable increase of genera by new discoveries, such old ones as *Ficus*, *Begonia*, *Arum*, *Erica*, &c. are divided\* into 10, 20, 30 or 40 independent ones, with names and characters to be recollected before any one species can be spoken of, if genera are to be reckoned by tens of thousands instead of thousands, the range of any individual botanist will be limited to a small portion of the whole field of the science. So also, so long as the number of orders can be kept within, or not much beyond a couple of hundred, it may reasonably be expected that a botanist of ordinary capacity shall obtain a sufficient general idea of their nature and characters to call them at any time individually to his mind for the purpose of comparison; but double that number, and all is confusion.

This inevitable confusion and the necessity of maintaining in some way the larger groups have been perceived by those even who have gone the farthest in lowering the scale of orders and genera. As a remedy they propose to erect the old genera into independent orders, and the old orders into classes or alliances. This is but an incomplete resumption of the old principles without the advantages of the old nomenclature.

It must be recollected that, although we choose a well-defined and natural group as the one to which we give a generic name, yet this is no indication that that group is considered as the *best* defined and better defined than the group immediately above it; on the contrary it is frequently less so. It is by no means pretended that *Urostigma* or *Pharmacosyce* are better defined than

\* And it must be borne in mind, that if genera so eminently natural and universally recognized as these, are to be thus subdivided and renamed for ordinary botanical parlance, so must *Carex*, *Rubus*, *Salix*, and hundreds of other equally well-established genera be.

the old genus *Ficus*, or that the new genera that have lately been cut out of the old genus *Begonia* form more natural groups than *Begonia* itself does; but the principle in these cases seems to be adopted, that the lowest definable group above a species is a genus. Go a step farther, and every species becomes a genus with a substantive name!

And let it not be forgotten, that although the analytical process carried to the uttermost is necessary for the purpose of ascertaining the facts upon which botanical science is based, it is a judicious synthesis alone which can enable the human mind to take anything like a comprehensive view of those facts, to deduce from them the principles of the science, or to communicate to others either facts or principles.

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Synopsis of the genus *Clitoria*.

By GEORGE BENTHAM, Esq., F.L.S.

[Read March 3rd, 1857.]

IN working up the *Phaseoleæ* with a view to defining the limits of the Brazilian species for Von Martius's Flora, the genus *Clitoria* has appeared to me to present some points of interest, as well in regard to its geographical distribution, as to its systematic demarcation. I have therefore been induced to offer to the Linnean Society the following short synopsis, prefaced by a few general remarks on both these points.

Of the two principal types of the genus, the one, *Ternatea*, is African and Asiatic, but apparently confined in Africa to the eastern tropical coast and adjacent Mascarene Islands, and in Asia to the nearly adjoining western districts of East India. The other type, *Clitoria* proper, is American, widely distributed over South America, east of the Andes, stretching northward into the southern United States of North America, and westward to the Cordilleras, in Mexico and Central America; but, even there, scarcely crossing to the west coast. It is one of the northern species of this American type, ranging on that continent from New Jersey to Mexico and Oaxaca, that reappears in great profusion in a very limited district in the Khasiya mountains in East Bengal, as well as in Tavoy, where it is accompanied by another apparently distinct species, found also in Java, but of the same North American type.

This singular identity of species in these two districts so widely separated, has been noticed before, but only in one or two in-

stances considered as quite exceptional. The case of the *Phryma leptostachya* has long been known, and is mentioned by Alph. De Candolle in his enumeration of what he terms *espèces disjointes*, which may be rendered by *discontinuous* or *dissevered* species. He also alludes to the *Saururus cernuus* as common to North America and China; the very remarkable circumstance of the rare *Tipularia* occurring at once in the eastern United States and in the Himalayas, was alluded to by Dr. Lindley, in a paper recently read to the Society; and we may now mention, as additional instances of perfect identity, the *Osmorhiza brevistylus* and *Monotropa uniflora*, common to these widely distant regions. My *Amphicarpæa Edgworthii*, from the Himalaya, is so closely allied to the common North American *A. monoica*, that the trifling differences observed in the few specimens examined would probably disappear in other specimens. And in such genera as *Schizanthus*, *Podophyllum*, *Thermopsis*, *Astilbe*, *Itea*, *Adenocaulon*, *Glossanthus*, *Turpinia*, *Streptopus*, *Trillium*, and many others—although the N. American or Mexican and Himalayan species may not be identical—yet their close affinity, in well-marked genera containing but very few species, has almost equal weight in regard to their geographical distribution.

The *Clitoria* which has been the occasion of these remarks is the *C. acuminata*, Wall., a common Khasiya plant, which proves to be identical with the original *C. Mariana*, Linn., from North America. When I gave a diagnosis of Wallich's plant in the 'Plantæ Junghuhnianæ,' this similarity did not strike me, owing to the greater luxuriance of the Indian specimens, their larger stipules, more pointed leaflets and calyx lobes, &c., frequent results of luxuriance in allied species; whilst the few American species I then possessed were all from the dry soils where they are said to grow in the United States. Having now, however, had before me a large number of specimens from a great variety of localities, I found, when I came to draw up comparative characters for the two supposed species, that several of the more luxuriant American ones from Texas and Mexico were, in the above-mentioned points also, identical with the East Indian plant.

The *C. macrophylla*, Wall., from Tavoy and Java, only known by a small number of specimens, still remains a detached East Asiatic representative of a considerable American type; a fact which calls to mind how frequently large American genera (such as *Eupatorium*, *Aster*, *Solidago*, *Solanum*, &c.) are represented in Eastern Asia by a small number of species, which gradually diminish or dis-

appear altogether as we proceed westward towards the Atlantic limits of Europe; whilst the types peculiar to the extreme west of Europe (excluding, of course, the Arctic flora) are wholly deficient in America. These are among the considerations which suggest an ancient continuity of territory between America and Asia under a latitude, or at any rate with a climate, more meridional than would be effected by a junction through the chains of the Aleutian and Kurile Islands.

In a systematic point of view I had formerly endeavoured to render *Clitoria* more natural, by the elimination of DeCandolle's section *Centrosema*; and I now find it necessary for the same purpose to unite with it the *Neurocarpum* of Desvaux, hitherto universally adopted by other botanists, myself included. This entails the giving up, as a generic character, one which, in *Leguminosæ*, is usually considered as absolute, the raised longitudinal nerve or wing along the centre of each valve of the pod. It is the same peculiarity which has induced the separation of *Tetragonolobus* from *Lotus* among European plants. But in the division of *Lotus*, as well as in that of *Clitoria*, this purely technical character is unaccompanied by any other differences, and I have now instances in *Clitoria* where it is inconstant in one and the same species, and even on the same specimen.

Before the introduction of Jussieu's natural system, carpological characters were comparatively little attended to; but from the time he first pointed out their great importance, the absolute necessity of taking them into consideration in all natural classifications, has been very properly insisted on by all the great botanists of modern days. There are instances, however, in which this principle may have been carried too far. The external forms acquired by fruits in their development from the ovary to maturity, and especially the foliaceous appendages they assume, are sometimes irrespective of their organic structure, and appear then of little more consequence than the foliaceous wings or appendages on the branches, inflorescences, or calyx tubes. So also the form of the membranous expansions of samaroid fruits, the consistence of pericarps, the number and arrangement on the calyx and other foliaceous appendages of the oleaginous deposits, called *transparent glands* in *Leguminosæ*, *Hypericineæ*, &c., or *vittæ* in *Umbelliferaæ*, useful as they all may be in certain cases, as indicative of general organic differences, have yet *per se* but little absolute value in classification. This absolute reliance, in supposed conformity to general principles, upon such characters, even when un-

accompanied by any other differences, is one of the sources whence botanical science is daily inundated by torrents of new genera, which threaten ere long completely to drown all system. Where the presence or absence of these appendages or glands, or any peculiarity in their arrangement, appears to be consequent upon a general difference in the plan of the fruit or in the habit of the plant, or is accompanied by corresponding characters in other organs, it should be carefully attended to. But where one or more species of a natural genus differ from the rest by some such external peculiarity in the development of the fruit alone, it seems against all principles laid down for a natural method, to take that peculiarity as a generic character, merely because it is a carpological one.

Neglecting, therefore, entirely the longitudinal wing of the pod (the development of lateral nerves in the carpellary leaf), we have a genus at once known by its calyx and corolla, and separable into two, or rather into three, types by habit and foliage, and probably also by the seed. So far as known, at least, the seeds of the sections *Ternatea* and *Neurocarpum* or *Clitoria* proper, are very different. I have collected the shrubby or lignescent American species into a third section, characterized by their habit only; for although in some species I have seen pods apparently full grown, yet the seeds are not far enough advanced to say whether they are compressed and smooth, as in *Ternatea*, or endued with the peculiar viscid exudation of *Neurocarpum*.

In nearly all the *Clitorias*, whether with or without winged pods, the lower flowers are often apetalous, almost without stamens, and with smaller calyxes, but producing perfect fruits. This circumstance, long since known in the allied genus *Amphicarpæa*, and more recently observed in *Clitoria glycinoides*, led, when first discovered, to the establishment of Leandro de Sacramento's genus *Martia*, in which Zuccarini included a similarly circumstanced species of *Galactia*.

#### CLITORIA.

*Clitoria* sp. Linn.—*Ternatea* et *Neurocarpum*, Desv.—H. B. et K. Nov. Gen. et Sp. Amer.—*Clitoria*, Sect. 1 et 2, et *Neurocarpum*, D.C. Prod. vol. ii.—*Clitoria* et *Neurocarpum*, Benth. in Ann. Mus. Vind. vol. ii. Calyx tubulosus, apice 5-fidus, laciniis superioribus latioribus, summis sæpe altius connatis, infima angustiore. Vexillum amplum, emarginatum v. bifidum, basi in unguem latum angustatum, exappendiculatum. Alæ falcato-oblongæ, vexillo breviores, longe unguiculatæ, patentes, carinæ breviori falcatæ acutæ cohærentes. Stamina mona-



delpha v. filamento vexillari demum soluto diadelphæ. Ovarium stipitatum, basi disco brevi cupulato circumdatum, pluriovulatum. Stylus incurvus, apice plus minus dilatatus, facie interiore longitudinaliter barbatus. Legumen stipitatum, lineare, valvulis planis v. convexis, nudis v. medio costa longitudinali percursis. Semina compressa v. subglobosa, estrophiolata.

Herbæ frutescæve, nunc volubiles v. alte scandentes, nunc humiles suberecti v. prostrati, Americani, Asiatici v. Orientali-Africani. Stipulæ persistentes, sæpe lineatæ. Folia pinnatim tri-pluri-foliolata, foliolis oppositis cum impari distante, stipellis setaceis, rarius subnullis. Pedunculi axillares, 1-2-flori v. racemiferi, floribus secus rachin solitariis v. sæpius geminis. Bracteæ persistentes, stipulis similes v. sæpius majores, inferiores binæ oppositæ distinctæ, superiores solitariae (duæ in unam coalitæ). Bracteolæ sub calyce geminae, vulgo bracteis majores. Flores speciosi (sæpe 2-3-pollicares) purpurascentes, cærulei, albi v. rubri.

#### Sect. I. TERNATEA.

Caulis herbaceus v. rarius fruticosus, prostratus, volubilis v. scandens. Folia 5-9-foliolata rarius subtrifoliolata. Leguminis valvulæ planæ v. leviter convexæ, non costatæ. Semina subreniformia, compressa, lævia.

1. *C. LASCIVA*, Boj. (Benth. in Ann. Mus. Vind. vol. ii. p. 114), caule fruticoso volubili foliisque subtus tomentoso-pubescentibus, foliolis 7-11 ovatis v. ovato-lanceolatis, stipellis setaceis, pedunculis elongatis bi-pluri-floris, bracteolis late ovatis acutis calycis dimidio brevioribus, legumine pubescente.

*Hab.* In ins. Madagascaria, ubi scandet in arbores et frutes, ad margines fluviorum provinciæ Betanimena oræ orientalis (Bojer).

2. *C. TERNATEA* (Linn. Spec. Pl. p. 1086), herbacea volubilis puberula, foliolis 5-7 rarius 9-11 ovatis oblongisve, pedunculis brevibus unifloris, bracteolis late ovatis orbiculatisve calycis dimidium subæquantibus, legumine acuminato pubescente.

*C. ternatea*, Bot. Mag. t. 1542.—*Ternatea vulgaris*, H. B. et K. Nov. Gen. et Sp. Amer. vol. vi. p. 415.

*Hab.* In Asiæ, Africæ, et Americæ regionibus calidioribus frequentissime culta et hinc inde quasi spontanea, verosimiliter in Africa orientali tropica indigena.

Foliola vulgo pollicaria v. majora. Flores azurei, fere bipollicares.

3. *C. PILOSULA* (Wall. Cat. Herb. Ind. n. 5347), herbacea volubilis pilosula, foliolis 5-7 parvis ovatis oblongisve, pedunculis brevibus unifloris, bracteis late ovatis orbiculatisve calycis dimidio brevioribus, legumine pubescente mutico.

*Hab.* In Indiæ Orientalis Peninsulæ provincia Concan (*Stocks*).

An *C. ternateæ* var.? Specimina pauca quæ vidi differre videntur foliolis

floribusque multo minoribus, legumine rectiore, vix  $1\frac{1}{4}$  poll. longo,  $2\frac{1}{2}$ -3 lin. lato.

4. *C. HETEROPHYLLA* (Lam. Dict. vol. ii. p. 51), glabra, caule tenui volubili, foliolis 5-7 parvis reticulatis foliorum inferiorum orbiculatis superiorum linearibus, stipellis minutis v. nullis, pedunculis brevibus unifloris, bracteolis ovatis acutis calyce pluries brevioribus, legumine plano glabro.

*Hab.* In ins. Mauritio (Sieber, n. 151, Telfuir, Gardner, &c.).

5. *C. BIFLORA* (Dalz. in Hook. Kew Journ. Bot. vol. ii. p. 35), herbacea pilosula suberecta, foliolis 3-5 ellipticis lanceolatisve, stipellis setaceis, floribus geminis subsessilibus reflexis, egumine brevi falcato plano pubescente.

*Hab.* In India Orientali prope Bombay (Dalzell, Law, Stocks, &c.).

Species inflorescentia et legumine distinctissima. Flores pro genere parvi.

- 6? *C. PEDUNCULATA* (Boj. Benth. in Ann. Mus. Vind. vol. ii. p. 114), glabra, caule filiformi, foliolis 3 lanceolato-linearibus acutiusculis, stipellis subnullis, pedunculis filiformibus unifloris, bracteolis lineari-lanceolatis acutis calyce multo brevioribus.

*Hab.* In ins. Madagascaria inter frutices ad margines fluviorum (Bojer). Specimina olim vidi in herbario Musæi Vindobonensis. Species mihi videbatur *C. heterophyllæ* valde affinis, sed diversa foliolis (an constanter) 3 nec pluribus duplo longioribus, et pedunculis longis tenuibus.

## Sect. II. NEUROCARPUM.

Herbæ volubiles v. prostrati v. breviter erecti. Folia uni- vel trifoliata. Leguminis valvulæ convexæ, costa longitudinali medio percursæ v. rarius ecostatæ. Semina globosa, ovoidæa v. crasse subreniformia, extus glanduloso-viscosa.

\* *Caule herbaceo volubili.*

7. *C. MACROPHYLLA* (Wall. Cat. Herb. Ind. n. 5345), caule rigido subvolubili piloso v. glabrato, foliolis 3 ovalibus subcoriaceis supra glabris subtus appresse pilosis, racemis brevissimis confertis, bracteis oblongis calycis tubo brevioribus, vexillo villosa, legumine glabro ecostato.

*C. javanica*, Miq. Fl. Ned. Ind. vol. i. p. 226.

*Hab.* In India Orientali, in montibus Prome et Tavoy (Wallich). In Java (Horsfield).

Foliola 3-4-pollicaria, petiolo communi flores superante. Flores  $1\frac{3}{4}$  poll. longi. Legumen bipollicare.

8. *C. MARIANA* (Linn. Spec. Pl. p. 1026), glabra v. vix pilosula, caule prostrato v. volubili, foliolis 3 ovato-oblongis v. lanceolatis membranaceis sæpius acutis, pedunculis 1-3-floris, bracteolis lanceolatis calyce multo brevioribus, vexillo glabro, legumine glabro ecostato.

*C. Mexicana*, Link. Enum. vol. ii. p. 235.—*C. acuminata*, Grah. in Wall. Cat. Herb. Ind. n. 5346.—*C. Grahmi*, Steud. Nom. Bot. ed. 2; Benth. in Pl. Jungh. vol. ii. p. 30.

*Hab.* In America septentrionali, in solo sicco præsertim secus fluvia a New Jersey ad Floridam et Alabama (*Torrey, Gray, &c.*). In prov. Texas (*Drummond, Lindheimer, &c.*); in Mexico in dumetis prope Jalapam (*Schiede et Deppe, Linden, n. 689*), prope Talea (*Hartweg*), in præruptis prov. Oaxaca, altit. 3000–4000 ped. (*Galeotti, n. 3146*), et in India orientali in montibus Khasiya, altit. 5000–6000 ped. (*Hooker fil. et Thomson, Griffith, n. 343, Lobb*), in Tavoy (*Wallich*).

Variat in solo pinguiore et calidiore foliolis et præsertim stipulis majoribus, calycis laciniis longioribus angustioribusque, &c., sed specimina Asiatica nequaquam a Mexicanis differunt.

9. *C. GLYCINOIDES* (D.C. Prod. vol. ii. p. 234), herbacea volubilis pubescens v. villosa, foliolis 3 ovatis oblongisve subtus sericeo-pubescentibus villosisve, pedunculis 1–3-floris, bracteolis ovato-lanceolatis calyce multo brevioribus, legumine subfalcato valvulis medio costatis v. rarius subnudis.

*C. falcata*, Lam. Dict. vol. ii. p. 51 ex parte ?\*.—*Neurocarpum falcatum*, DC. Prod. vol. ii. p. 236.—*Clitoria rubiginosa*, Pers. Syn. vol. ii. p. 303.—*Neurocarpum glycinoides, rubiginosum, ellipticum et villosum*, Desv. cfr. Ann. Sc. Nat. Par. ser. 1. vol. ix. p. 413.—*Martia physalodes*, Leandr. Sacr. Denkschr. Acad. Mun. vol. vii. p. 23. t. 12.—*Martia brasiliensis*, Zuccar.—*Neurocarpum argenteum*, Duchass. et Walp. in Flora, 1853, p. 228.

*Hab.* In America orientali tropica frequens; in tota Brasilia, in Peruvia orientali (cis-Andina), Guiana, insulis Indiæ occidentalis, et in Panama.

\*\* *Caule prostrato flagellari.*

10. *C. FLAGELLARIS*, herbacea, rufo-pubescent, ramis prostrato-flagellatis, foliolis 3 oblongo-lanceolatis obtusis utrinque villosulis, pedunculis 1–3-floris, bracteolis lato-lanceolatis calyce multo brevioribus, legumine costato.

*Neurocarpum flagellare*, Benth. in Hook. Journ. Bot. vol. ii. p. 58.

*Hab.* Ad Rio Branco Brasiliæ borealis (*Schomburgk*).

Specimina perpauca vidi a *C. glycinoides* distincta imprimis ramis non volubilibus et foliolis angustis.

11. *C. RUFESCENS*, herbacea procumbens (v. subvolubilis?), foliolis 3 oblongo-ovatis ellipticisve mucronatis subtus ramis pedunculisque rufo-villosis, pedunculis 1–3-floris, bracteolis ovato-acutis calyce multo brevioribus.

*Neurocarpum rufescens*, Benth. in Ann. Mus. Vind. vol. ii. p. 116.

*Hab.* In Brasiliæ campis editis ad Tejuco et Villa do Principe prov. Minas Geraes (*Martius*).

\* Lamarck's description of the fruit does not agree with that of this species, but DeCandolle, who saw the original specimen in Jussieu's herbarium, had certainly this plant in view. If the identity is confirmed, Lamarck's specific name should be adopted. That of Persoon is applicable only to the more hairy varieties.

Species e specimine unico descripta intermedia videtur inter *C. glycinoiden* et sequentes. Flores fere *C. guianensis* sed calyx rufo-villosus et bracteolæ latiores.

\*\*\* *Caule e rhizomate lignoso herbaceo ascendente v. erecto vix ramoso.*

12. *C. NANA*, herbacea pilosula v. glabrata, caule abbreviato, foliolis 3 oblongis ellipticisve, pedunculis unifloris, bracteolis lineari-lanceolatis calyce multo brevioribus, leguminis valvulis nudis.

*Hab.* In Brasiliæ meridionalis prov. Rio Grande, in campis siccis prope Porto Alegre (*Tweedie*).

Caules e rhizomate lignoso 1-4-pollicares. Planta cæterum formis minimis *C. guianensis* similis, sed floris color diversus videtur et leguminis valvulæ (semper?) ecostatæ.

13. *C. SIMPLICIFOLIA*, herbacea erecta subsimplex glabra, foliolo subsessili ovali obtuso basi rotundato, pedunculis bifloris racemosisve, bracteolis lanceolatis calyce multo brevioribus, leguminis valvulis costatis.

*Neurocarpum simplicifolium*, Kunth, Mimos. p. 213. t. 59.

*Hab.* In locis arenosis ad margines fluviorum, &c. ad flum. Orinoco (*Humboldt et Bonpland*), in Brasiliæ prov. Goyaz et Pernambuco (*Gardner*, n. 2822 et 3669).

Caules e rhizomate lignoso semipedales ad pedales. Foliola semper vidi solitaria subcoriacea. Flores *C. guianensis*.

14. *C. GUIANENSIS*, herbacea erecta v. adscendens glabra v. albobilosa, foliolis 3 longe oblongis linearibus v. imis solitariis, pedunculis 1-2-floris, bracteolis lanceolatis calyce multo brevioribus, leguminis valvulis costatis v. rarissime subnudis.

*Crotalaria guianensis*, Aubl. Pl. Gui. vol. ii. p. 761. t. 305\*.—*Crotalaria longifolia*, Lam. Dict. vol. ii. p. 201.—*Neurocarpum angustifolium*, Kunth, Mimos. p. 218. t. 60.—*N. guianense*, Desv. Journ. Bot. 1814, vol. i. p. 75.—*N. longifolium* et *N. frigidulum*, Mart., Benth. in Ann. Mus. Vind. vol. ii. p. 116.

*Hab.* —?

Caules e rhizomate lignoso semipedales ad pedales. Foliola sæpe semipedalia. Calyx 12-15 lin., corolla 2 poll. longa. Species differt a *C. nana* statura et legumine, a *C. simplicifolia* foliolis ternis angustis, a *C. cajanæfolia* statura humiliori, foliolis longioribus subtus minus canescentibus.

15. *C. CAJANÆFOLIA*, herbacea erecta plus minus canescens, foliolis 3 oblongis v. imis solitariis, pedunculis 1-2-floris, bracteolis ovatis calyce multo brevioribus, leguminis valvulis costatis v. rarius nudis.

*Neurocarpum cajanæfolium*, Presl. Symb. Bot. p. 17. t. 9.—*N. retusum*, Hassk. Pl. Jav. rar. p. 376.—*Lotus fluminensis*, Vell. Fl. Flum. vol. vii.

\* Aublet's drawing and description agree in everything but the corolla, which he evidently only had in an imperfect shrivelled-state.

- t. 132.—*Clitoria laurifolia*, Poir. Dict. Suppl. vol. ii. p. 301.—*Neurocarpum laurifolium*, Desv. (forma glabrior legumine sæpius ecostato).  
*Hab.* In Brasiliæ et Guianæ collibus imis arenosis frequens, etiam in ins. Trinitatis (Sieber, n. 187), Porto Rico et S. Domingo (Poiteau in Herb. Mus. Par.), et ex America allata in Java (Zollinger, n. 748, v. 784 in Herb. meo), Malacca (Griffith), et Singapore (Herb. Hooker).
- A *C. guianensi* vix characteribus certis definienda etsi habitu facile recognoscenda. Caulis rigidior, elatior, vulgo 1-2-pedalis; foliola raro 3 pollices excedunt, vulgo obtusissima v. retusa, subtus canescentia v. sericeo-villosa. Flores paullo minores. Legumen variat costa longitudinali elevata v. tenui v. (in speciminibus a me olim in herbariis nonnullis sub nomine *C. glycinoides*, DC. in Herb. Mus. Par. distinctis) omnino nulla. Specimina nonnulla Gardneriana utrumque legumen ostendunt in eadem planta.
16. *C. DENSIFLORA*, herbacea erecta, caule ferrugineo-villosulo, foliolis 3 obovali-oblongis infra glabris subtus sericeo-villosis, pedunculis bifloris in axillis superioribus abbreviatis, bracteis lanceolatis calyce brevioribus, leguminis valvulis costatis.  
*Neurocarpum densiflorum*, Benth. in Ann. Mus. Vind. vol. ii. p. 117.  
*Hab.* In campis fruticetisque Brasiliæ provinciæ Minas Geraes (Pohl, St. Hilaire, Weddell).  
 Præcedenti affinis sed villosior, foliola magis coriacea latiora, stipulæ et bracteæ majores acuminatæ striatæ, inflorescentia densior.
17. *C. STIPULARIS*, herbacea erecta, caule piloso, foliolis 3 ovali-ellipticis subtus glaucis tenuiter puberulis, pedunculis plurifloris folio brevioribus, bracteolis lanceolatis membranaceis calyce paullo brevioribus, leguminis valvulis costatis.  
*Neurocarpum bracteatum*, Mart., Benth. in Ann. Mus. Vind. vol. ii. p. 116.  
*Hab.* In sylvis Catingas Brasiliæ provinciæ Bahia (Martius).  
 Caules basi duri, bipedales (v. altiores?). Stipulæ, bracteæ et bracteolæ membranaceæ, majores quam in præcedentibus. Pedunculi elongati, vulgo 4-6-flori. Flores paulo minores videntur.

## Sect. III. CLITORIANTHES.

Frutices erecti v. alte scandentes, ramulis tunc plus minus volubilibus. Folia trifoliolata. Leguminis valvulæ coriaceæ, planæ v. leviter convexæ. Semina matura ignota.

\* *Bracteolis angustis v. calyce multo brevioribus.*

18. *C. POLYSTACHYA* (Benth. Pl. Hartw. p. 60), fruticosa erecta ramosa, foliolis oblongis sublanceolatisve superioribus acutis subtus ramulisque sericeo-pubescentibus, pedunculis multifloris, bracteolis parvis linearibus, leguminis valvulis turgidulis ecostatis.  
*Hab.* In Mexico prope Talea (Hartweg), ad San Dionysio in ditione Oaxaca (Andrieux, n. 463).  
 Species quodammodo inter *Neurocarpa* et *Clitorianthes* ambigit, a

prioribus caule fruticoso et inflorescentia differt, legumen tamen brevius valvulis convexioribus quam in *Clitorianthis* plerisque.

19. *C. BRACHYSTEGIA* (Benth. Bot. Sulph. p. 84), fruticosa elata subscandens, foliolis 3 ovatis supra glabris subtus tenuissime puberulis glabrisve, racemis multifloris, bracteolis minimis ovatis, calyce amplo brevi, vexillo pubescente.

*Hab.* In Peruvia prope Guayaquil (*Sinclair*).

Habitus et folia *C. arborescentis* sed glabrior, et calyx quam in omnibus *Clitoriis* proportionem latior, dentibus brevibus late orbicularibus obtusissimis v. vix aculeatis, infima angustiore triangulari. Corolla omnino *C. arborescentis*. Legumen non vidi.

20. *C. ARBORESCENS* (Ait. Hort. Kew. ed. 2. vol. iv. p. 302), fruticosa elata v. subscandens, foliolis 3 ovatis ellipticisve supra glabris subtus pallide v. rufo-pubescentibus v. sericeo-villosis, racemis multifloris, bracteolis acuminatis calyce multo brevioribus, vexillo pubescente, legumine elongato plano valvulis coriaceis ecostatis.

*C. Poitai*, DC. Prod. vol. ii. p. 234. *C. amœna*, Miq. Stirp. Surin. p. 24.

*Hab.* In America tropica in Surinamo (*Hostmann*, n. 50 et 1097, *Kappler*, n. 1933), in Guiana gallica (*Perrottet*), et anglica (*Anderson*, *Parker*, *Rob. Schomburgk*, coll. ii. n. 849, *Rich. Schomburgk*, n. 1331), in ins. Trinitatis (*Lockhart*), St. Vincentii (*Guilding*), et in Panama (*Cuming*, n. 1142, *Sinclair*).

Frutex ab aliis collectoribus elegans dicitur fere arborescens ramis divaricatis diffusisve, ab aliis frutex scandens. Foliola subcoriacea, ampla, maxima usque ad 8 poll. longa, 4 poll. lata, ramealia dimidio minora. Pedunculi folio breviores, a basi pluri- v. multiflori. Flores breviter pedicellati. Bracteolæ vulgo 2-3 lin., interdum 6 lin. longæ, angustæ. Calyx pollicaris, dentibus acutis v. acuminatis. Vexillum bipollicare. Legumen stipitatum, 5-8 poll. longum, 6-9 lin. latum, maturum tamen non vidi.

21. *C. SELLOI*, fruticosa volubilis, ramulis villosis, foliolis 3 ellipticis v. oblongis acuminatis subtus rufo-sericeis, racemis brevibus multifloris, bracteolis lanceolatis calyce multo brevioribus, vexillo vix pilosulo.

*Hab.* In Brasilia (media? v. australiore?) (*Sello*).

Affinis *C. arborescenti*, sed rami volubiles, folia et flores minores. Foliola 3-4 poll. longa, 15-18 lin. lata, apice abrupte acuminata. Calyx circa 7 lin. longus laxè pilosus. Corolla vix sesquipollicaris, vexillo dorso medio pilosulo. Legumen non vidi.

22. *C. JAVITENSIS*, caule lignoso alte scandente v. repente glabro, foliolis 3 ovatis ellipticisve acuminatis glabris v. subtus parce pilosulis, racemis brevibus paucifloris, bracteolis parvis lanceolatis, vexillo puberulo.

*Neurocarpum javitense*, H. B. K. Nov. Gen. et Sp. Amer. vol. vi. p. 409.

*Hab.* In Brasilia boreali ad ripas Rio Negro (*Spruce*, n. 1877 et 2320),

in ripa flum. Teramini prope Javitam (*Humboldt et Bonpland*), et in Guiana anglica (*Rob. Schomburgk*, coll. ii. n. 1000, *Rich. Schomburgk*, n. 1723).

Species vix satis nota. Specimina *Schomburgkiana* et *Spruceana* incompleta sunt, *Humboldtiani* non nisi fragmenta suppetunt in Herb. Mus. Par. A *C. arborescenti* differt glabritie, ramis tenerioribus, petiolis clongatis, inflorescentia brevi, bracteolis parvis. Flores *C. arborescentis*. Legumen non visum.

23. *C. LEPTOSTACHYA*, caule lignoso volubili alte scandente glabro, foliolis 3 ellipticis oblongisve acuminatis glabris, racemis elongatis tenuibus, floribus per paria distantibus, bracteis bracteolisque minimis linearibus, vexillo minute puberulo.

*Hab.* In Guiana anglica ad flumen Corentyn superius prope fines Brasiliensium (*Rob. Schomburgk*, coll. ii. sine num.), et in Surinamo (*Hostmann*) (fide racemo unico absque foliis).

Species inflorescentia distinctissima. Caules sæpe elevato-triquetri faciebus sulcatis, raro teretes. Petioli graciles, 3-8-pollicares. Foliola maxima 7-8 poll. longa, 2 poll. lata, alia dimidio minora, omnia longe et anguste acuminata. Racemi ad axillas solitarii v. ad nodos vetustos fasciculati, nunc 3-4-pollicares nunc pedales, rhachi tenui. Flores in speciminibus *Schomburgkianis* bipollicares, in *Hostmanniano* fere tripollicares.

\*\* *Bracteolis ovatis coriaceis striatis calyces subæquantibus.*

24. *C. AMAZONUM* (Mart., Benth. in Ann. Mus. Vind. vol. ii. p. 115), caule fruticoso suberecto v. scandente glabro, foliolis 3 ovatis acuminatis glabris v. subtus pilosulis, racemis brevibus ramosis, bracteis pedicello multo brevioribus, bracteolis ovalibus coriaceis calyces subæquantibus, vexillo glabro v. vix minute tomentello.

*C. acuminata*, Benth. in Ann. Mus. Vind. vol. ii. p. 115.

*Hab.* In Brasilia boreali in locis sylvaticis fruticetisque ad ripas flum. Solimoes Rio Negro et Amazonum frequens.

Species habitu, foliis, floribus *C. arborescenti* sat similis et pariter variat caule suberecto v. scandente, foliolis majoribus v. minoribus latioribus angustioribusque, sed primo intuitu distinguitur bracteolis 9 lin. longis latis concavis coriaceis striatis apice obtusis v. interdum fissis calyci adpressis. Inflorescentia etiam sæpius ramosa. Legumen *C. arborescentis*, sed omnino maturum non vidi.

25. *C. HOFFMANSEGGII*, caule fruticoso elato suberecto glabriusculo, racemis petiolisque puberulis, foliolis ex obovato ovatis ellipticisve obtusis v. subacuminatis, racemis brevibus ramosis, bracteis ovatis pedicellum subæquantibus, bracteolis ovalibus coriaceis calyces subæquantibus, vexillo sericeo-pubescente v. villosa.

*C. arborea*, Benth. in Ann. Mus. Vind. vol. ii. p. 115 (non *C. arborescens*, Ait.).

*Hab.* In Brasilia boreali ad Para (*Siber in Herb. Mart.*), ad Rio Ma-

dura (*Herb. Mus. Petrop.*), et in Peruvia cisandina prope Mozobamba et Tarapoto (*Matthews*).

Species non satis nota *C. amazonum* valde affinis et forte ejus varietas. Differre videtur caule (ex *Siber* et *Matthews*) altiore arborescente, pube, bracteis majoribus numerosis plerisque 4 lin. longis, calyce paullo brevior, vexillo villosiore.

26. *C. RACEMOSA* (Benth. in *Ann. Mus. Vind.* vol. ii. p. 115), caule fruticoso glabriusculo, foliolis ovatis ellipticisve acuminatis coriaceis glabris v. subtus pubescentibus, racemis dense multifloris, bracteis pedicello vix brevioribus, bracteolis ovalibus coriaceis calycem subæquantibus, vexillo sericeo-pubescente v. villosa.

*Hab.* In Brasiliæ prov. Goyaz prope Natividade (*Pohl*).

Frutex v. arbor ramis diffusis *C. amazonum* affinis. Foliola magis coriacea, venis primariis parallelis crebrioribus. Racemi vulgo folia æquant v. superant, nunc fere pedales, a medio ad apicem dense floridi, bracteis numerosis 2-3 lin. longis. Flores *C. amazonum*, sed bracteolæ et calyces tenuiter tomentelli et vexillum molliter sericeum.

Supersunt species duæ a G. Don in ins. St. Thomæ lectæ, *C. racemosa* et *C. alba*, ejusd. Gard. Dict. vol. ii. p. 213, verosimiliter vel ad *C. glycinoiden* referendæ vel e genere excludendæ.

On the Cultivation of Mosses. By the Rev. H. H. HIGGINS.  
Communicated by N. B. WARD, Esq., F.L.S.

[Read February 3rd, 1857.]

I SEND a few particulars respecting the cultivation of Mosses, of which about two hundred and forty species have been planted in my bryarium, which is a glass case about 4 feet 6 inches long, 22 inches from back to front, and 26 inches in height. It is fitted with shelves, and has two doors, one of which is generally left only partially closed. The plants are in separate pots, and are never removed from the case, but are kept in the shade and frequently watered with a syringe. Care is taken to procure suitable kinds of soil; but in most instances the soil is sparingly used, the pots being more than half filled with drainage.

ANDREACEÆ.—*A. rupestris* flourished and fruited till the second season. If removed with a portion of the rock attached, it might last much longer.

SPHAGNACEÆ.—The pots were set in trays of water, and no soil was put into them. Six species, five of them in fruit, were planted, and did well for the first year. *S. acutiflorum* alone fruited the second year. They are now almost extinct.



PHASCEÆ.—From a fine patch of *P. nitidum* only one or two plants came up the second year.

WEISSIÆ.—Seem permanent. *W. controversa* fruits profusely about a month before its usual time.

DICRANÆ.—*Stylostegium cæspititium* from Ben Lawers soon perished. *Dicranum polycarpum* and *D. virens*, from the same locality, flourish; the former fruits vigorously. Eight other species, some of them Alpine, seem permanently established. *Leucobryum glaucum* does not alter in the least.

CAMPYLOPODEÆ.—*C. longipilus*, from Scotland, thrives; and the common species bears fruit.

POTTIÆ.—*P. Heimii* dies rapidly. *P. truncata* fruits.

TRICHOSTOMEÆ.—*Tri. tophaceum* and *homomallum* disappear. The *Tortulæ* mostly do well, but the case contains no Alpine species. *T. ruralis* overgrows itself and dies.

ENCALYPTEÆ.—*E. vulgaris* fruited and disappeared. *E. ciliata* remains, but is barren. Two Alpine species from Ben Lawers are unhealthy.

HEDWIGIÆ.—*H. ciliata* remains, but wants attention.

GRIMMIÆ.—*G. pulvinata* is a charming little plant for cultivation, but must be kept rather dry. Several others do fairly. All the *Racomitria*, except two, flourish and are very ornamental.

ORTHOTRICHEÆ.—Tied upon small blocks of wood, and suspended, they live, and some of them bear fruit, but do not appear thoroughly healthy. *Zygodon Lapponicus* and *Z. Mougeotii* are on the wane. *Tetraphis pellucida* holds its own well, but does not fruit.

POLYTRICHEÆ.—*Pogonatum nanum* is gone. *P. aloides* and *P. urnigerum* grow, and fruit beautifully: even *P. alpinum* does better than many. The *Polytricha* have not succeeded well.

BRYÆ.—*Aulacomnium palustre* is most desirable for cultivation; it grows freely, and the tall pseudopodia have been abundant and very interesting. *Leptobryum pyriforme* should be excluded if possible; it becomes a perfect pest, growing everywhere but in its own pot. *Bryum*: about twenty-four species of this genus grow in the case; the best are *B. nutans* and *carneum*, both of them very beautiful in fruit. *B. alpinum* retains its fine crimson colour. *B. julaceum* and *B. Zierii* both do well, whilst the common *B. argenteum* has been often changed, and is now given up. *B. roseum*

has been disturbed a good deal, ♂ and ♀ specimens having been planted together to try if fruit would be produced; but as yet there is no appearance of fertility. *B. Marratii*, *B. calophyllum*, and *B. Warneum* are not healthy. *Mnium*: all that have been tried do well.

MEESIEÆ.—*Meesia uliginosa* puts forth setæ of prodigious length; a rather suspicious circumstance in respect of its congener *M. longiseta*.

FUNARIEÆ.—*Physcomitrium pyriforme*. The fruit in its season is so dense that not a leaf can be seen.

BARTRAMIEÆ.—*Bartramia*. All are included except *B. rigida*. The best and most satisfactory mosses for growing in cultivation. Nothing of the kind can exceed them in beauty of colour, growth, and fruit. *Catoscopium nigrum* is gone.

SPLACHNEÆ.—*S. ampullaceum* and *S. sphaericum* have been only lately received; but *Tetraplodon mnioides*, on the bones of a rabbit, has grown and fruited for two seasons most vigorously.

FISSIDENTEÆ are gems for cultivation. *F. adiantoides* is a portion of a specimen which has been in cultivation for twenty years. *Antitrichia curtipendula* is not healthy.

ISOETHECIEÆ.—The *Pterogonia* are weakly. The *Isothecia* flourish. *Climacium dendroides* has been very fine, but now droops. *Leskea sericea* and *L. polycarpa* are very beautiful. *L. latebricola* and *pulvinata* are fast disappearing.

HYPNEÆ.—Of *Hypnum* sixty species are included. They are not easily kept in order on account of their straggling habit. The vitality of the plant seems to leave the root and the centre, and to reside almost entirely in the extremities. If these be cut off, the plant will not throw up fresh shoots from the root, but perishes. In some instances I have therefore cut off and planted in fresh and suitable soil the extremities of the fronds; and these have made young and vigorous specimens. The experiment is however too recent to be considered conclusive. Many of the rare Alpine species have been tried, but most of them are in a sickly state. *H. Crista-Castrensis* seems to thrive, but does not form so handsome a plant as *H. uncinatum*. *H. loreum* becomes in appearance exactly like *H. squarrosum*. *H. atro-virens*, from Ben Lawers, is very beautiful. No *Hypna* fruit with me but those which are commonly found fertile; *H. cordifolium* is perhaps an exception.

OMALIEÆ.—*O. trichomanoides* is healthy. *Neckera crispa* is tied

to a flat stone and suspended; it is in a very satisfactory condition.

HOOKERIEÆ.—*H. lucens* never changes: in winter and summer it is alike beautiful. It is now fruiting pretty freely.

FONTINALEÆ.—*F. antipyretica* fails.

HEPATICÆ.—*Riccia fluitans* grows in a very interesting way. *Targionia hypophylla* is gone. The *Marchantiæ* grow too freely. *Jungermannia*: I have had twenty-seven species; some of them, e. g. *J. tomentella*, *J. ciliaris*, *J. spinulosa* and *J. asplenoides*, are as beautiful as any plants in the case. Some of the species fruit profusely, pouring out a stream of silvery translucent fruit-stalks, tipped with little shining ebony heads, which, when expanded, show very remarkable hygrometric properties. *J. nemoralis* is covered with little dark-coloured gemmæ.

*Bartramia Halleriana* grew last autumn with a fringe of *Hymenophyllum*, with which it was collected near Loch Lomond, and was as round and as finely in fruit as a bush of Mistletoe.

On the Structure of the Seeds of *Barringtonia* and *Careya*. By  
THOMAS THOMSON, Esq., M.D., F.R.S., F.L.S., Superintendent  
of the Calcutta Botanical Garden.

[Read March 17, 1857.]

THE internal structure of the seeds of *Barringtonia* and *Careya* has long been a matter of doubt, and indeed continues to the present day to be described by different authors very differently, being by some regarded as exalbuminous, while others represent the embryo as lying in the axis of copious albumen.

The genus *Barringtonia* originated with Forster, but two of its species were known to Linnæus, and referred by him to the genera *Mammea* and *Eugenia* respectively. The descriptions of Linnæus, Forster and Lamarck do not refer to the internal structure; but as Jussieu\* refers the genus to *Myrtaceæ*, an order which he describes as exalbuminous, he seems to imply a similar structure in *Barringtonia*.

Gærtner† (1791) describes *Barringtonia* as albuminous, but adds that the albumen adheres firmly to the entirely undivided embryo in which cotyledons and radicle are undistinguishable.

\* Genera, p. 326.

† Sem. ii. 97.

In 1826, Blume\*, without noticing Gærtner's description, ascribes to *Barringtonia* an exalbuminous seed, with a rugose undivided or pseudomonocotyledonous embryo. DeCandolle† in 1828 adopted the same view, but his description of the seed seems derived chiefly if not entirely from Blume.

The genus *Careya* was published for the first time by Roxburgh in 1819 in the third volume of the 'Coromandel Plants.' As the library of the Calcutta Garden does not contain a complete copy of this work, I have not at present access to Roxburgh's figure; but as the letter-press does not refer to the structure of the seed, it is probably not represented in the plate.

The earliest published account of the seed of *Careya* is that of Buchanan Hamilton‡, in his commentary on the '*Hortus Malabaricus*' of Rheede, which appeared in 1827. He describes it as undoubtedly albuminous, with a straight terete central embryo, subacute at both ends, and as long as the albumen.

The second volume of Roxburgh's '*Flora Indica*,' published in 1832, contains a detailed account of that botanist's observations on the seeds of both genera. In *Barringtonia*§ he describes a copious albumen, with a simple embryo (without cotyledons) of the same length situated in its axis. He adds, however, several details, which seem to show that he considered the structure obscure and anomalous. In particular he tells us that the embryo forms the ligneous centre of the shoots, or, as he says a little lower down, the wood and pith, while the perisperm furnishes the cortical part and the leaves.

The seed of *Careya*|| is described almost in the same terms as that of *Barringtonia*,—with a simple embryo as long as the copious albumen; and it is again stated that the embryo furnishes the centre or ligneous part, and the perisperm the cortical part of the young plant. It is added that the radicle issues from the small end of the seed close to the umbilicus, and the scaly plumule from the opposite end, a structure identical with that indicated as existing in *Barringtonia*, in which the solitary seed is pendulous, and the root is developed from the apex of the fruit; or in modern botanical terms, the radicle is next the hilum and the seed anatropous.

In 1834 Wight and Arnott¶ describe the seeds of both genera as exalbuminous, with the large embryo not separable into cotyledons and radicle, but formed of two concentric homogeneous com-

\* Bijdr. 1096.

† Prodr. iii. 288.

‡ Linn. Trans. xv. 96.

§ Fl. Ind. ii. 635.

|| Fl. Ind. ii. 638.

¶ Prodr. Fl. Ind. p. 334.

bined layers. As these authors possessed no ripe seeds, this character is an inference from a careful comparison of Gærtner's figure and description with the descriptions of Roxburgh and Blume, and perhaps with Roxburgh's drawing in the India House. As the result of this comparison, they state that they have no doubt that the structure in both genera is identical, and that the supposed albumen is part of the embryo, while no real albumen exists.

In 1839-40 Endlicher ('Genera Plantarum') ascribes to both genera an exalbuminous embryo united with the cotyledons into a homogeneous fleshy mass, and makes no allusion to the double layer clearly indicated in Gærtner's figure, and described by Roxburgh and Wight and Arnott.

In 1841 Wight, returning to the subject in the second volume of the 'Illustrations\*,' abandons the views which are given by Arnott and himself in the 'Prodromus,' and says that Roxburgh correctly describes the seed as having a simple inverse embryo the length of the ample perisperm.

In 1853 Lindley†, following Hamilton, Roxburgh and Wight, ascribes to the tribe *Barringtoniæ* an embryo in the axis of copious fleshy albumen.

Griffith's excellent observations on these anomalous seeds were not published till 1854‡, and consist only of the rough notes attached to the drawings; the subject, though too important to be entirely neglected by so indefatigable an observer, having only come before him cursorily, so that the notes made at one time are somewhat at variance with those at another. His remarks are so important that I shall quote them at length. At page 657 of the work quoted he says, "The seed of *Barringtonia* is sufficiently remarkable: I imagine the central part represents above the radicle, below the plumule; and I also imagine that all the part between the lowest scales of the superficies and the radicle is adherent cotyledon. Or is it an instance of an immense radicle and two or several minute cotyledons (represented by scales and an inconspicuous plumule)? To this, which is suggested by the radicular central system being internal, not reaching the superficies, there is a great objection in the irregularity, in number and situation, of the scales. The internality may arise from the cotyledons being produced into basilar auriculæ, concealing and enclosing the roots, as occasionally happens. The development only will clear up the point, for even if the scales become enlarged and foliaceous during

\* p. 19. t. 100.

† Veg. Kingd. 754.

‡ Notulæ, vol. iv.

germination, they will not, I think, necessarily become plumulary, some cotyledons during germination becoming decidedly leafy. On the whole this peculiar embryo appears to me distinctly analogous to that of *Dracontium*, and in a less degree to that of *Cryptocoryne*."

In the illustrations to the fourth volume of Griffith's 'Notulæ,' t. 636. f. 1 represents a longitudinal section of a ripe seed of *Barringtonia conoidea*, Griff., and in the description of the plates he refers to a central and peripheral system, at the plumular end of the latter of which two small notches are seen. Fig. 2 of the same plate shows a similar section of *B. racemosa*, and shows at *b, b* the primary or first-formed scales, and at *c, c* the secondary-formed scales.

In plate 634 A the four figures in the left upper corner represent longitudinal sections of the seed of *Careya herbacea*, Roxb. The references to the letters are found in the 'Notulæ\*.' In the general description of the plant he gives it white fleshy albumen and an undivided central embryo united to the albumen. In the references, however, he has evidently in view the above-quoted general remarks on *Barringtonia*, calling the notches at the plumular end of the peripheral system cotyledons, and adding above, "at first the long section shows only two notches, then it shows four, the two last nearly enclosing the plumule†."

In 1855 Miquel‡, following Blume and Endlicher, gives to both genera an exalbuminous embryo, in which cotyledons and embryo are blended into a homogeneous mass.

From the preceding details it will be seen that Gärtner, Blume, Hamilton, Roxburgh, Wight, and Griffith are the original au-

\* iv. 661.

† An earlier view taken by Griffith, in reference to the seed of *Careya*, is given in the abstract of a paper by him, dated July 1st, 1835, and published in the 'Proceedings of the Linnean Society,' vol. i. pp. 280-1. In this abstract, after describing both the seed and its germination, it is said:—"The absolute nature of the outer fleshy part, Mr. Griffith observes, can only be determined by pursuing the development of the ovule. The nature of the subulate body is evident: it is the root, the true plumula being the minute scaly body at its distal end. The root points, as it should do, towards one side of the hilum, the situation in fact of the foramen. At the collet it is continuous with the plumula, and laterally with the outer fleshy mass, which ought therefore to be cotyledonary, and taking it to be so, might be explained by supposing the cotyledons to be affixed in a peltate manner, and united into a solid mass." There is little essential difference between this view and that proposed by Blume and adopted by DeCandolle and Endlicher, in regard to *Barringtonia*.—SECR.

‡ Fl. Ned. Ind. i. 484.

thorities, from whom all systematists have copied, and that there are three distinct modes in which the structure has been viewed:—

1. As an undivided exalbuminous embryo, which is the statement of Blume, followed by Endlicher and Meisner.

2. As an embryo in the axis of copious albumen. This view originated with Gärtner, and was adopted by Hamilton, Roxburgh, Wight, and Lindley.

3. As an exalbuminous embryo in two layers, a view first promulgated by Wight and Arnott, and doubtfully adopted by Griffith.

The manifest contradiction involved in these different modes of describing the same parts in a seed of considerable size induced me to take the first opportunity of examining ripe and germinating seeds. This I have now been able to do for two seasons in the Calcutta Botanic Garden, and the structure is so simple, that it will require much less time to describe it than has been occupied in the enumeration of the views of previous observers.

An inspection of the ripe seed of *Barringtonia* or *Careya* shows at once that it is not perfectly homogeneous. A transverse section of any part of the seed presents, as in Gärtner's plate of *Barringtonia* and Wight's of *Careya*, two concentric layers, separated by a ring of darker-coloured tissue, which has an organic connexion with both layers. A longitudinal section, as is shown in Gärtner's, Wight's, and Lindley's plates, as well as in those of Griffith, exhibits the central body extending throughout the whole length of the seed, and surrounded by the supposed albumen, from which it is separated on either side by a narrow line of darker-coloured tissue. The shape of the central body is dependent on the shape of the seed, and therefore varies in different species of the two genera; but the relative position of the parts remains the same in all.

The microscope shows that both of these bodies consist of ordinary cellular tissue full of starch-granules; but that the separating layer, which is in organic connexion with both, consists of a very thin or almost single layer of delicate wood-cells (pleurencyhema) intermixed with barred and true (unrollable) spiral vessels.

The integuments of the seed are readily separable in *Careya*; they adhere somewhat firmly both to the fruit and the seed in *Barringtonia*, but can be detached with a little care from the embryo, most easily near the plumule. An examination of the surface of the embryo before germination shows that, except two minute and scarcely perceptible notches, first noticed by Griffith,

at the extremity from which the stem is afterwards developed, the surface is perfectly uniform.

Roxburgh's MSS. drawings in the library of the Calcutta Botanic Garden contain excellent figures of the germinating seeds of *Careya arborea* and *Barringtonia racemosa*. My examination of the germination of *Careya* has confirmed Roxburgh's observations, and I found that, allowing for difference of size and shape, the germination of *Barringtonia acutangula*, the species I examined, is exactly like that of *B. racemosa*, as figured by Roxburgh.

In all, the only appearances of foliar organs are a few minute scales surrounding the growing point, which is gradually elongated into the ascending axis. On this axis the earlier leaves are quite rudimentary, and true leaves are not developed till it has become one or two inches long.

A longitudinal section of a germinating plant shows that the central body is continuous with the pith, and the superficial body with the bark, as Roxburgh has long ago stated. It further shows that the vascular layer, which separates the two, is continuous both upwards and downwards with the ligneo-vascular cylinder of the stem and root.

It is thus evident: 1. That the embryo of *Barringtonia* is exalbuminous. 2. That the cotyledons are rudimentary. 3. That the embryo is an axial organ, consisting of pith, woody layer, and bark. 4. That the plumule, at best almost without scales, is developed into a stem, while the opposite extremity elongates into a root.

In examining nearly a hundred germinating plants of *Careya arborea*, I found that in a considerable number (eight or ten instances) the primary axis died off, and the stem was continued by a bud springing from the axil of one of the minute scales. In one instance this took place so close to the embryo as to be apparently in the axil of one of the first pair of scales, or rudimentary cotyledons.

In describing the seeds of *Garcinia* and *Xanthochymus*, Roxburgh states that their structure is quite like that of the seeds of *Careya* and *Barringtonia*, except that the central portion (which he calls the embryo) is very slender, and that the permanent root proceeds from the base of the plumule, while that from the opposite end of the embryo soon perishes, or remains slender as compared with the other.

Such adventitious roots are of common occurrence also in *Careya*, so that the difference is even less than Roxburgh supposed. Circumstances prevented my examining germinating seeds



of *Xanthochymus*, grown here for the purpose last year, but I hope to be able to do so before the end of the present season.

### EXPLANATION OF PLATE I. A.

Fig. 1. Germinating plant of *Careya arborea*, Roxb.

Fig. 2. Another plant of the same, with the seed cut longitudinally.

Fig. 3. Germinating seed of *Barringtonia racemosa*, Blume, after Dr. Roxburgh's drawing.

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Note on some young plants of *Cardamine hirsuta*, growing from buds formed on the upper surface of old leaves of that plant, exhibited March 3rd and 17th, 1857. By Miss LLEWELYN of Penllergare, near Swansea. Extracted from a Letter to G. BENTHAM, Esq., F.L.S.

[Read March 17th, 1857.]

IN January 1857 I observed a number of small leaves strewn about on a flower-bed, some green and some purple; on examining them I found that they were all growing by means of small, white fibrous roots—protruded in several places from the upper surface of the leaf, which is usually turned down on the earth. In many instances young leaf-stalks and small leaves were formed, all attached to the parent leaf, which appears to be that of *Cardamine hirsuta*, L.

A large plant of this weed was destroyed in the same bed, in September 1856, when leaves were broken off and accidentally scattered around.

Since January I have observed many instances of the same leaf-plants in other parts of the garden; and in one other instance I can trace the young weeds to the same cause.

Penllergare, March 3rd, 1857.

### *Memorandum by George Bentham, Esq.*

These very curious specimens appeared mostly to be the larger, and especially the terminal, segments of the leaves of *Cardamine hirsuta*, and the young plants were generally growing from the upper surface close to the junction with the petiole, with here and there a few tufts of roots from other parts of the surface; but in some specimens there were two or three young plants growing from scattered points on the surface of the segment.

*Præcursores ad Floram Indicam.* By J. D. HOOKER, Esq., M.D., F.R.S. & L.S., and T. THOMSON, Esq., M.D., F.R.S. & L.S.

(Continued from page 29.)

SERIES II. SAXIFRAGEÆ (including *Hydrangeæ*, &c.), CRASSULACEÆ, DROSERACEÆ, PARNASSIÆ, GROSSULARIÆ, HAMAMELIDEÆ, and PHILADELPHÆÆ.

THE Orders here grouped together appear to us to stand in more immediate connexion with one another than with any other Indian Orders, and to be intimately connected with *Corneæ* and its allies on the one hand, and *Rosaceæ* on the other. From *Corneæ* and its allies they differ much in the structure and number of their ovules, which are numerous, except in some *Hamamelideæ*, and in their less constant characters of the carpels being partially free from one another and from the calyx or apex of the peduncle, the rarely valvate floral envelopes, and the more numerous stamens. From *Rosaceæ* they are less definitely though more naturally separated, and the Himalayan genera *Neillia* and *Astilbe* form a very close connecting link between these Orders. Of these, *Neillia* may safely be referred to *Saxifrageæ*; and *Astilbe* must, technically, fall into *Saxifrageæ* also, though its relationship to *Spiræa* is all but generic. *Polyosma*, appended by Brown and Bennett to *Escalloniæ*, presents the strongest resemblance to *Corneæ* in many respects.

We have endeavoured to give a conspectus of these Orders, with their diagnostic characters drawn from the Indian genera, from which it will be seen, that though all of them are very natural groups, they are to a great extent undistinguishable by characters. *Saxifrageæ*, by being made to include the fruticose genera *Adamia*, *Hydrangea*, *Itea*, and *Polyosma*, has a very different value from the succeeding Orders, which are all of them as naturally parts of *Saxifrageæ* as many of the genera included under it are. *Philadelphææ* might without violence be brought next to *Hydrangea*; *Parnassia*, though exalbuminous, is nearly related to *Saxifraga* itself, as indicated by Brown and others, and displays the same singular economy of the stamens advancing by pairs to the stigmata, the same texture of its persistent petals, and a habit so similar; that when in the Himalaya, their close affinity appeared to us self-evident. *Hamamelideæ* might be brought under *Cunoniæ*, the remarkable stipules of *Bucklandia* finding an exact homologue in *Cunonia* itself, whilst amongst other genera of both Orders many cross affinities may be traced. *Droseraceæ* and *Grossulariæ* seem

to us to be rather aberrant members of *Saxifragæ* in its extended significance, than separate Orders; the former having many points in common with *Saxifragæ*, as the persistent marcescent sub-perigynous petals, which, and the stamens, are absolutely perigynous in some Antarctic species, indicating, as it appears to us, stronger affinities with this group than M. Planchon admits in his able paper on the genus\*. It is not, however, our intention to discuss such questions at length in the "Præcursores;" and we therefore proceed with the systematic arrangement of the genera and species.

DIAGNOSES ORDINUM AD GENERA INDICA RECENSENDÆ.

- I. SAXIFRAGÆ. *Calyx* superus v. inferus. *Petala* valvata v. imbricata. *Stamina* 4–20, epigyna v. perigyna. *Ovarium* 1–10-loculare, stylis connatis v. distinctis. *Fructus* capsularis v. baccatus, 1–10-locularis, placentis axillaribus, suturalibus, parietalibusve. *Semina* albuminosa.—*Habitus*, folia et inflorescentia varia.
- II. PARNASSIÆ. *Calyx* semi-superus v. inferus. *Petala* 4–5, imbricata. *Stamina* 4–5, perigyna, staminodiis alternantia. *Ovarium* 1-loculare, placentis 3, parietalibus; stylis 3, v. 1, trilobo. *Capsula* coriacea. *Semina* exalbuminosa.—*Herbæ glaberrimæ, temperatæ*; foliis radicalibus; scapis foliatis, 1-floris; floribus hermaphroditis.
- III. DROSERÆ. *Calyx* inferus, 5-lobus, v. 5-partitus. *Petala* 5, subhypogyna, imbricata. *Stamina* 5, subhypogyna. *Ovarium* 5-loculare, placentis 3–5 parietalibus; stylis 3–5. *Capsula* 3–5-valvis, valvis medio placentiferis. *Semina* albuminosa.—*Herbæ temperatæ et tropicæ, pleræque glanduloso-pilosæ*; foliis omnibus radicalibus circinatis; scapis ebracteatis; floribus racemosis, hermaphroditis.—*Habitus*, &c. *Aldrovandræ* peculiaris.
- IV. GROSSULARIÆ. *Calyx* superus, tubo supra ovarium producto, 4–5-fido. *Petala* 4–5, fauce calycis inserta, parva, imbricata. *Stamina* 4–5, cum petalis inserta. *Ovarium* 1-loculare, placentis 2–4 parietalibus v. semiseptis adnatis; stylis 2–4, distinctis. *Bacca* pulposa. *Semina* albuminosa.—*Frutices temperatæ, sæpius glandulosæ*; foliis alternis, vernatione plicatis; floribus racemosis subsolitariisve, hermaphroditis v. polygamodioicis.
- V. HAMAMELIDÆ. *Calyx* semi-superus, lobis 5–7. *Petala* 4–5 v. 0, calyce inserta, sæpius ligulata, imbricata v. basi valvata. *Stamina* 5 v. plura, calyce inserta. *Ovarium* biloculare, ovulis 1

\* Ann. Sci. Nat. sér. 3. vol. ix. p. 90.

v. numerosis, placentis axillaribus adnatis; *stylis* 2. *Capsula* bipartibilis v. bifida, epicarpio soluto. *Semina* albuminosa.—Frutices v. arbores *temperatæ et subtropicæ*; pilis *plerisque stellatis*; foliis *alternis, stipulatis*; floribus *racemosis v. capitatis, calycibus interdum coadunatis, hermaphroditis v. unisexualibus*.

VI. PHILADELPHÆÆ. *Calyx* superus, 4–5-fidus, lobis valvatis. *Petala* 4–5 disco epigyno inserta, convoluta v. valvatim induplicativa. *Stamina* 10 v. plura, cum petalis inserta, filamentis planis. *Ovarium* 3–10-loculare, placentis angulo centrali adnatis; ovulis numerosis; *stylis* 3–5, filiformibus, liberis v. connatis. *Capsula* vertice septicide v. loculicide dehiscens. *Semina* albuminosa; testa membranacea, laxa, ultra nucleum producta.—Frutices *temperatæ*; pilis *dum adsunt sæpe stellatis*; foliis *oppositis, exstipulatis*; floribus *albis, trichotome cymosis v. paniculatis, hermaphroditis*.

VII. CRASSULACEÆ. *Calyx* liber 3–20-partitus, lobis imbricatis persistentibus. *Petala* totidem perigyna, imbricata v. valvata, libera v. gamopetala. *Stamina* 6–20 cum petalis inserta v. iis adnata. *Squamulæ hypogynæ* tot quot ovaria, iis oppositæ, rarius 0. *Ovaria* tot quot petala et iis opposita, verticillata, libera v. rarius syncarpa, 1-locularia, placentis marginalibus. *Capsulæ* folliculares, liberæ. *Semina* minima, scobiformia, albumine tenuissimo v. 0.—Herbæ *carnosæ*; caule v. rhizomate *interdum lignoso*; foliis *oppositis alternisve, exstipulatis, interdum compositis*; floribus *hermaphroditis, rarius unisexualibus, plerisque cymosis racemosisve*.

## I. SAXIFRAGEÆ.—DIAGNOSES GENERUM.

### A. HERBACEÆ.

1. SAXIFRAGA, *L.* *Calyx* liber v. basi ovarii adnatus, sepalis imbricatis. *Petala* 4–5, perigyna. *Stamina* 10, perigyna. *Ovarium* 2–3-loculare; *stylis* 2–3, liberis.—Herbæ *temperatæ et alpinæ pleræque cæspitosæ*; foliis *alternis, exstipulatis*.
2. VAHLIA, *Thunb.* *Calyx* ovario adnatus; lobis valvatis. *Petala* et *stamina* 5, epigyna. *Ovarium* 1-loculare, placentis geminis pendulis; *stylis* 2.—Herbæ *tropicæ*; foliis *oppositis, exstipulatis*.
3. CHRYSOSPLENIUM, *L.* *Calyx* ovario adnatus, 4–5-fidus. *Petala* 0. *Stamina* 8–10, disco epigyno inserta. *Ovarium* 1-loculare, placentis 2, prope basin ovarii insertis; *stylis* 2.—Herbæ *temperatæ et alpinæ*; foliis *oppositis alternisque, exstipulatis*.

4. *TIARELLA, L.* *Calyx* campanulatus, basi imo ovarii adnatus; lobis 5, valvatis. *Petala* 5, perigyna. *Stamina* 10, perigyna. *Ovarium* biloculare, placentis basi dissepimenti adnatis; *stylis* 2.—Herba *temperata*; foliis *plerisque radicalibus*.
5. *ASTILBE, Ham.* *Calyx* basi ovario adnatus, lobis imbricatis. *Petala* 4–5, perigyna, v. 0. *Stamina* 8–10, perigyna. *Ovaria* 2, libera; placentis suturalibus.—Herbæ *elatae*; foliis *alternis, compositis, stipulatis*.

## B. FRUTICES v. ARBORES.

6. *NEILLIA, Don.* *Calyx* basi ovario adnatus, lobis 5, valvatis. *Petala* 5, perigyna. *Stamina* numerosa, perigyna. *Ovarium* 1, 1-loculare; placenta suturali.—Frutices *temperatae*; foliis *alternis, stipulatis, lobatis*.
7. *HYDRANGÆA, L.* *Calyx* superus, floribus sterilibus petaloideus, fertilibus 4–5-dentatus. *Petala* epigyna, valvata. *Stamina* 8–10, epigyna. *Ovarium* inferum 2-loculare; placentis dissepimenti marginibus adnatis; *stylis* 2. *Fructus* capsularis.—Frutices v. arbores *temperatae*; foliis *oppositis, exstipulatis*.
8. *ADAMIA, Wall.* *Calyx* superus, 5-dentatus, sinubus latis. *Petala* 5, epigyna, sessilia, valvata. *Stamina* 10, epigyna. *Ovarium* incomplete 3–5-loculare, placentis semiseptorum marginibus adnatis; *stylis* 3–5. *Bacca* 1-locularis; placentis 3–5 parietalibus.—Frutex *temperata*; foliis *oppositis, simplicibus, serratis*.
9. *POLYOSMA, Blume.* *Calyx* superus, 5-lobus. *Petala* 4, epigyna, linearia, valvata. *Stamina* 4, epigyna. *Ovarium* 1-loculare, placentis 2 parietalibus; *stylo* elongato; *stigmat*e simplici. *Bacca* monosperma.—Arbores et frutices *tropicæ*; foliis *oppositis, exstipulatis*.
10. *ITEA, L.* *Calyx* inferus, campanulatus, 5-fidus. *Petala* 5, perigyna, valvata. *Stamina* 5, perigyna. *Ovarium* 2-loculare, placentis juxta medium dissepimenti utrinque biseriatis; *stylo* simplici demum bipartibili. *Capsula* bipartibilis.—Arbores *subtropicæ*; foliis *alternis, exstipulatis*.
11. *PILEOSTEGIA (H. f. & T.).* *Calyx* semisuperus, obconicus, 4–5-lobus. *Petala* 4–5 calyce inserta, valvata, calyptratis subcoherentia. *Stamina* 8–10 cum petalis inserta. *Ovarium* 5-loculare; ovulis numerosis elongatis, ex apice loculi pendulis; *stylo* crasso clavato, *stigmat*e 5–6-sulcato truncato apice 5–6-lobo, ad angulos lineis 5–6 longitudinalibus stigmatiferis instructo.

*Fructus?*—Arbor v. frutex ramulis subteretibus; foliis oppositis, exstipulatis, coriaceis; inflorescentia terminali cymoso-paniculata, ramis decussatim oppositis; floribus pedicellatis, subfasciculatis.

### 1. SAXIFRAGA, L.

With the solitary exception of *S. ligulata*, which is found also in the Khasia Mountains, all the Indian species are natives of the temperate and alpine regions of the Himalaya and Tibet, affecting precisely similar situations to what they do in Europe and the Arctic regions; and several of the species, as *S. hemisphærica*, *imbricata*, *saginoides*, and *Jacquemontiana*, attain the extremest limit in altitude of vegetation. The number of species seems to increase in the Eastern Himalaya, 28 being found to the eastward of Central Nipal, and only 24 to the westward of that meridian, of which latter several are not found west of Kumaon, whilst the unexplored Eastern alpine regions of Bhotan, Abor, &c. may be expected to yield many novelties. Of the Himalayan species we have referred seven to European ones, with tolerable confidence; they are, *S. flagellaris*, *granulata*, *cernua*, *Sibirica*, *orientalis*, *oppositifolia*, and *Hirculus*, of which all but the first and last are exclusively Western Himalayan. The remainder, with the exception of *S. ramulosa*, which approaches *S. cæsia* and *aretoides*, and *S. ciliata*, which is closely allied to the Siberian *S. crassifolia*, are all very distinct from the species of other countries.

The following synopsis of the Indian Saxifrages requires a little prefacing. We do not offer it as being at all likely to be uninfluenced as to its results by future discoveries. Saxifrages are more numerous in species and as frequent in individuals, in the Himalaya as in the Alps and Pyrenees, and analogous differences in opinion as to what should be considered distinct types amongst these, will be encountered by Indian botanists, when the suites of Himalayan specimens are as copious and accessible as the European are. It is true that the most puzzling group of all, the divided-leaved *Dactyloides*, does not perhaps exist in the Himalaya, but it is compensated for by the number and abundance of the *Hirculus* section, which is apparently scarcely less variable. Our materials have been three different times very carefully studied, at distant intervals; and the results of the second and third examinations have led to almost identical conclusions as to the number and limits of the forms. These limits are no doubt in some cases artificially drawn; the absence of connecting links in our collections, the de-

ficiency of specimens in different stages of development, and from different conditions of soil, climate, &c., the oversight of minute but permanent and natural characters, and the over-estimate of more conspicuous but less constant unimportant ones, are, after all, though the common, not the only, or in all cases the most numerous causes of diversity of opinion as to specific limits in such a genus. The subtler sources of error are, preconceived notions originating with the circumstances under which the specimens are first brought before us, alive or dried, and dominant ideas founded upon a previous study of the genus in other parts of the world. In short, all the advantages which a skilled naturalist derives from familiarity with his subject under other phases—from a full knowledge of the labours of others, and from having himself studied the majority of his materials in their native localities—have concealed within them certain sources of errors in judgement which influence the results of the closest observer and most skilful reasoner.

Such being the case, we feel that something is required of us beyond the simple assurance that we have given a more than average amount of careful comparative and microscopic study to so difficult a genus; we have, in the next place, well compared our forms with the identical, analogous, and representative species of Siberia, Europe, and North America; and we have collected almost all our Scotch Saxifrages, and studied those of the Alps a little in their native localities. We have carefully examined numerous specimens from almost all Indian collectors, and 35 out of the 39 species have been gathered by one or both of us, many of them in numerous localities. Having upon these data formed an approximate estimate of the limits of the Himalayan forms, and found that they allowed much latitude for difference of opinion as to a very considerable proportion of the species, we sought some European standard work with the views of which our Indian results might on the whole accord; and have selected Koch's '*Flora Germanica*,' as being that which best represents our ideas of the limits of the European forms. Whether all these forms of European or Indian Saxifrages are to be considered specific, is quite another question, and one which we cannot solve; all we can do with propriety is to indicate what seem most marked, and what least so.

To put this matter in a practical form, we may say, that if we carried out what appears to us the most extreme views that could possibly be adopted towards uniting forms, we should reduce the Indian Saxifrages to 26, by uniting as varieties, the three of the

*Bergenia* group; *ramulosa* and *imbricata*; *granulata*, *cernua*, and *odontophylla*, with possibly *Sibirica*; *stenophylla* and *flagellaris*; *brachypoda* and *fimbriata*; *palpebrata* and *cordigera*; *saginoides* and *Hirculus*; *corymbosa*, *diversifolia*, and *latiflora*; *Jacquemontiana* and *Stella-aurea*; between some of which we find intermediate specimens do occur, and between others such may be found in future.

On the other hand, it would probably meet the views of those who take the extreme opposite view, to extend the species founded on our materials to 47, by dividing *ligulata* and *Stracheyi* each into two; the same with *ramulosa*, *imbricata*, *flagellaris*, *corymbosa*, *Hirculus*, and *diversifolia*. Of all these, we think the varieties of *Stracheyi* and *corymbosa* best entitled to reconsideration.

From this it appears that nearly half the forms we have examined are extremely variable; but the difficulty does not end here, for of the 26 most distinct forms, upwards of half have been gathered in one province alone, most of them by one individual, and in one or a few spots only; and no one can predicate the direction or limits within which they will prove variable when all their forms shall have been studied.

We have not attempted to give detailed descriptions of the species, and our diagnoses are little better than indications of the most prominent differential and other characters which the forms present. Whatever views may be taken of the limits between the species, as here proposed, there can be none about the certainty, that other specimens of them from different quarters of the Himalaya will greatly influence their diagnoses and render detailed descriptions of them worthless. What we have endeavoured to do, is to give a correct systematized review of the genus as it is developed in India, in every case indicating the forms which those who attach a different value from ourselves to the word 'species,' may combine or keep separate.

### Gen. I. SAXIFRAGA, L.

§ I. BERGENIA. *Rhizoma* crassum. *Folia* ampla; petiolo basi dilatato. *Calyx* 5-lobus, lobis obtusis erectis. *Petala* alba v. rosea v. purpurea.

1. SAXIFRAGA LIGULATA, Wall. (in *As. Trans.* xiii. 398). Foliis orbiculatis obovatisve basi cordatis integerrimis ciliatis, panicula glaberrima.
  - a. Foliis amplis utrinque glabratiss, petiolis late orbiculatis. *S. ligulata*, Hook. Bot. Mag. 3406; Exot. Flora, i. t. 49.



*β. ciliata*, foliis amplis utrinque hirsutis, petalis ovatis. *S. ciliata*, Royle, Ill. 226. t. 49. f. 2; Hook. Bot. Mag. 4915.

*γ.* Foliis minoribus utrinque glabratissimis obovatis basi cordatis, petiolis brevibus, petalis obovato-cuneatis. *S. ciliata*, Lindl. Bot. Reg. 1843, t. 65?

*Hab.* Rupibus Himalayæ totæ temperatæ et subtropicæ, alt. 4000–10,000 ped. a Bhotan! *Griffith*; ad Marri! *Fleming*. Montibus Khasia, alt. 4000–5000 ped.! *De Silva*, &c. (fl. vere.) (v. v.)

Variat foliis 2 unc. ad pedalem diametro, margine integerrimo v. denticulato, paginis utrisque hirsutis glaberrimisve lævissimis v. punctatis; petiolis brevibus elongatisve robustis gracilibusve, basi longe v. breve vaginantibus, hirsutis glaberrimisve; *panicula* parce v. copiose dichotome ramosa, pedicellis brevibus v. elongatis; *floribus* paucis v. numerosis,  $\frac{1}{8}$  ad 1 unc. latis; *calycis* lobis glaberrimis ciliatisve; petalis late obovato-orbiculatis cuneatisve, brevibus elongatisve, albis roseis v. subpurpurascens; *carpellis* 2–3; *stylis* erectis v. divaricatis.

2. SAXIFRAGA STRACHEYI (Hf. & T.). Foliis obovatis obovato-cuneatisve grosse crenatis basi angustatis non aut vix cordatis, panicula glanduloso-pubescente. (Potius forma alpina *S. ligulatæ*.)

*α.* Foliis obovatis ciliatis subtus punctatis. *S. ciliata*, Lindl. in Bot. Reg. 1843, t. 65? (Cf. *S. ligulata γ.*)

*β.* Foliis cuneato-oblongis supra medium profunde crenatis non ciliatis subtus epunctatis (forma valde distincta).

*Hab.* Regione temperata et alpina Himalayæ occidentalis, alt. 8000–14,000 ped. Kumaon! *Strachey & Winterbottom*. Simla! Kuna-wur! Kishtwar! et Kashmir! *Thomson* (fl. Jun.) (v. v.)

Var. *β.* in Tibetia occidentali temperata et alpina, alt. 10,000–15,000 ped. Zanskar! *Thomson*. (v. v.)

Habitus et characteres pleræque *S. ligulatæ*, sed minor, foliis angustioribus basi angustatis vix cordatis paniculaque glanduloso-pubescente. In var. *β.* flores fid. *T. MSS.* luteoli, in *α.* albi v. pallide rosei, iis *S. ligulatæ* omnino similes.

3. SAXIFRAGA PURPURASCENS (Hf. & T.). Foliis obovato-rotundatis integerrimis glaberrimis, panicula pauciflora corymbosa glanduloso-pubescente, calyce profunde 5-lobato, petalis obovato-oblongis purpureis, floribus nutantibus.

*Hab.* In Himalaya orientali temperata et alpina Sikkim! alt. 10,000–14,000 ped., *J. D. H.* (fl. Maio.) (v. v.)

Verosimiliter species distincta ob calycem profundius 5-lobum, sed habitu characteribusque pluribus cum *S. Stracheyi* convenit, differt foliis latioribus glaberrimis eciliatis integerrimisque, panicula pauciflora, floribus omnibus nutantibus, petalisque purpureis.—*Folia* 2–3 unc. longa, interdum obscure sinuata, sæpius impresso-punctata. *Scapus* 3–6-pollicaris. *Flores*  $\frac{3}{4}$ –1 unc. lati. *Calyx* glandulosus. *Petala* interdum longe unguiculata.

§ II. PORPHYRION. Cæspitosi. *Folia* subopposita, parva, crasse coriacea. *Calyx* 5-lobus, lobis obtusis erectis. *Petala* purpurea v. rosea.

4. SAXIFRAGA OPPOSITIFOLIA (Linn. Sp. Pl. 575). Dense cæspitosa, foliis imbricatis suboppositis oblongis obtusis ciliolatis, floribus sessilibus terminalibus erectis, petalis purpureis lineari-obovatis.—D.C. Prodr. iv. 17; Smith, Engl. Bot. t. 9.

*Hab.* Tibetia boreali-occidentali alpina. Nubra, alt. 15,000–17,000 ped. ! Thomson (fl. Aug.) (v. v.)

*Distr.* Alpibus Europæ et Asiæ borealis, terrisque arcticis hemisphæræ borealis.

*Exemplaribus* Europæis omnino congruit. *Carpella* 2–3.

§ III. AIZOONIA. Cæspitosi. *Folia* alterna, imbricata, subsessilia, crasse coriacea, cartilagineo-marginata, sæpe porosa. *Flores* flavi v. albi. *Calyx* 5-lobus, lobis erectis.

5. SAXIFRAGA RAMULOSA (Wall. Cat. 446). Foliis imbricatis rosulatis lineari-oblongis acutis v. mucronatis glaberrimis interdum foveolatis, pedunculis brevibus 1-floris calycibusque glanduloso-hirsutis.

α. Major, foliis  $\frac{1}{3}$  unc. longis, interdum basi ciliatis, floribus  $\frac{1}{2}$  unc. diam.

β. Minor, densius cæspitosa, foliis brevibus superne oblique truncatis apice foveolato, floribus parvis.

*Hab.* Himalaya occidentali temperata et subalpina; Kumaon et Garwhal, alt. 8000–12,000 ped. ! Blinkworth, &c. Var. β. alt. 10,000–13,000 ped. ! Edgeworth, &c. (fl. æstate.)

*Saxifrugæ cæsiæ et aretioidi* affinis.

6. SAXIFRAGA IMBRICATA (Royle, Ill. 226. t. 49). Densissime cæspitosa, foliis brevibus arcte imbricatis breviter ovatis obtusis supremis apice truncato perforatis, floribus sessilibus, calyce glanduloso-pubescente.

α. Foliis ciliatis supremis v. omnibus apice perforatis et sæpius marcescentibus. *S. ciliata*, Walp. non Royle.

β. Foliis glabris supremis v. omnibus apice perforatis et sæpius marcescentibus.

γ. Foliis omnibus glaberrimis ovato-oblongis non perforatis.

δ. Foliis ciliatis non perforatis.

*Hab.* Regionibus alpinis Himalayæ totius et Tibetiæ, alt. 12,000–18,000 ped. a Sikkim ! J. D. H. ; ad Kashmir ! Jacquemont. (fl. Jun., Jul.) (v. v.)

*Species* protea et verosimiliter forma alpina *S. ramulosæ*. Var. δ. ad *S. Jacquemontianam* tendet.

7. SAXIFRAGA HEMISPHERICA (Hf. & T.). Densissime cæspitosa, foliis arctissime imbricatis ovato-oblongis obtusis margine scariosis longe ciliatis, floribus minimis sessilibus, sepalis distinctis lineari-oblongis obtusis late scarioso-ciliatis, carpellis brevibus.

*Hab.* Himalaya orientali alpina; Sikkim locis aridis, alt. 16,000–18,000 ped.! *J. D. H.* (fl. Jul.) (v. v.)

Species singularis hemisphæras parvas efficiens, ob foliorum margines scariosas argenteas crebre ciliatas facile distinguenda. *Petala* non visa, an ulla?—*Habitus* et folia *S. perpusillæ* subsimilia. *Filamenta* lineari-elongata plana.

§ IV. NEPHROPHYLLUM. In speciebus Himalaicis *caules* foliosi. *Folia* rotundato-cordata, sparsa, dentata v. lobata. *Flores* inter majores, paniculati. *Calyx* parvus, profunde 5-fidus, lobis erectis, basi ovario adhærens. *Petala* alba.

8. SAXIFRAGA GRANULATA (*Linn. Sp. Pl.* 577). Perennis, rhizomate bulbifero, caule simplici glanduloso-pubescente, foliis reniformi-rotundatis 5–9-lobatis crenatisve supremis 3–5-fidis, floribus paniculatis, calycis lobis oblongis obtusiusculis, petalis albis spathulato-obovatis ter brevioribus.—*D.C. Prodr.* iv. 35 (descript. styli except.); *Engl. Bot.* t. 500.

*Hab.* Himalaya occidentali subalpina et alpina, alt. 10,000–15,000 ped. Kumaon! et Garwhal! *Edgeworth, Strachey* et *Winterbottom*. Kunawur! *Royle*. Zanskar! Kishtwar! et Kashmir! *Thomson*. (fl. Jun., Jul.) (v. v.)

*Distr.* Europa tota temperata et Africa boreali.

Cum exemplaribus Anglicis omnino congruit.

9. SAXIFRAGA CERNUA (*Linn. Sp. Pl.* 577). Perennis, rhizomate bulbifero, caule simplici glabriusculo, foliis reniformi-rotundatis 5–7-lobis supremis oblongis bulbiferis (*i. e.* flores abortivos gerentibus), floribus solitariis paucisve, sepalis liberis oblongis obtusis, petalis albis obovato-spathulatis. (Certe forma alpina *S. granulata*.)—*D.C. Prodr.* iv. 37; *Engl. Bot.* t. 664.

*Hab.* Tibetia occidentali alpina, alt. 15,000–17,000 ped.! Ladak! Nubra! &c. *T. Thomson* et *H. Strachey*. (fl. Aug.) (v. v.)

*Distr.* Alpibus Europæ, Americæ borealis temperatæ, Asiæ borealis, terrisque Arcticis.

Exacte cum exemplaribus Scoticis quadrat.

10. SAXIFRAGA ORIENTALIS? (*Jacquin, Obs.* ix. t. 34). Annua, caule gracili ramoso puberulo, foliis reniformi-rotundatis acute et grosse 7–9-dentatis lobulatisve superioribus cuneatis acute 5-lobis, floribus terminalibus solitariis parvis, sepalis ovato-oblongis acutis, petalis spathulatis, stylis gracilibus, stigmatibus capitatis.—*Don in Linn. Trans.* xiii. 369.

*Hab.* Himalaya occidentali alpina. Kumaon, alt. 14,000–15,000 ped.! *Strachey* et *Winterbottom*.

*Distr.* Asia Minor, Syria, Caucaso.

Exemplaria pauca plantæ Asiæ orientalis simillima.

11. *SAXIFRAGA ODONTOPHYLLA* (Wall. Cat. 454). Perennis, glanduloso-pubescent, rhizomate bulbifero, caule simplici v. superne ramoso, foliis late reniformibus 7-12-lobulatis, lobulis latis rotundatis obtusis apiculatisve, floribus paniculatis racemosisque, sepalis lineari-oblongis.

*Hab.* Himalaya occidentali subalpina. Kumaon! *Blinkworth*. Kulu ad Rotang Pass, alt. 12,000 ped., *Edgeworth*. (fl. Aug.)

*S. granulata* similis, sed caule robustiore, foliis plerisque radicalibus latoribus reniformibus, lobulis pluribus et obtusis; foliis caulinis nullis v. paucis et majoribus; floribusque majoribus.

12. *SAXIFRAGA SIBIRICA* (Linn. Sp. Pl. 577). Perennis, rhizomate squamato, caule debili basi petiolisque pubescente superne ramoso, foliis radicalibus reniformi-rotundatis 3-7-lobulatis lobulis subacutis superioribus simplicibus lanceolatis v. 3-lobis, floribus paniculatis pedicellis remotis gracilibus elongatis calycibusque puberulis glabrisve, sepalis ovatis, petalis albis obovato-spathulatis.—*Don in Linn. Trans.* xiii. 365; *Sternberg, Saxif.* 23. t. 25.

*Hab.* Himalaya occidentali temperata. Kishtwar, alt. 8000-9000 ped. ! *Thomson*. (fl. Jun.) (v. v.)

*Distr.* Omni Siberia, Caucaso, et America occidentali arctica.

§ V. *ARABIDEA*. *Caulis* v. *scapus* erectus, foliosus. *Folia* alterna, subcuneata, plana, dentata. *Flores* albi. *Calyx* liber, patens.

13. *SAXIFRAGA STRIGOSA* (Wall. Cat. 448). Hispido-pilosa, caule rigido glanduloso basi folioso superne foliato ramoso, foliis radicalibus rosulatis lanceolatis acutis grosse inæqualiter paucidentatis caulinis sessilibus oblongis, axillis supremis bulbiferis, flore subsolitario pedicello gracili, sepalis ovato-lanceolatis glanduloso-pilosis, petalis albis, ovario oblongo, stylis brevibus.—*D.C. Prodr.* iv. 41.

*Hab.* Himalaya centrali et orientali subalpina, alt. 9000-14,000 ped. Bhotan! *Griffith*. Nepal! *Wallich*. Sikkim! *J. D. H.* (fl. Jul.) (v. v.)

*Herba* spithamæa, rigida. *Folia radicalia* petiolata, 1-1½-pollicaria, *caulina* sæpe reflexa. *Rami supremi* ob bractæas bulbiferas patulas v. reflexas subsquarrosi. *Flos* sub ⅓ unc. diametr.; *sepala* et *petala* patentia.

§ VI. *MICRANTHES*. *Caulis* subnullus. *Folia* radicalia petiolata. *Scapus* paniculatus. *Calyx* basi ovario adhærens, conicus. *Petala* alba.

14. *SAXIFRAGA MICRANTHA* (*Edgew. in Linn. Trans.* xx. 50). Glabrata v. basi parce pilosa, foliis radicalibus longe petiolatis ovato-cordatis obtusis profunde crenatis, scapo nudo superne ramoso ad axillas foliato, pedicellis pubescentibus, floribus paniculatis minimis, capsulis majusculis oblongis stylis brevibus.

*Hab.* Himalaya temperata et subalpina. Kumaon, alt. 9000-10,000

ped.! *Edgeworth*. Sikkim, alt. 10,000–14,000 ped., *J. D. H.* (fl. Jul.) (v. v.)

*Folia* 1–1½ unc. longa. *Scapi* spithamæi et ultra. *Pedicelli* fructiferi elongati. *Calyx* basi conicus. *Petala* post anthesin crescentia, late obovata, interdum inæqualia. *Filamenta* plana, supra medium dilatata; antheris rotundatis. *Carpella* 2–3, punctata.

15. *SAXIFRAGA PALLIDA* (*Wall. Cat.* 450). Foliis radicalibus ovatis crenato-serratis dentatisve, scapo simplici v. ramoso glabro v. pubescenti-piloso, bracteis lanceolatis inferioribus interdum bulbiferis, floribus majusculis solitariis paniculatisve, calyce basi conico ovario adnato lobis demum reflexis, petalis albis ellipticis, filamentis linearibus, capsulis late oblongis, stylis brevibus.—*D.C. Prodr.* iv. 38.

*Hab.* Himalaya alpina. Kumaon! *Blinkworth*; alt. 14,500 ped.! *Strachey & Winterbottom*. Nepal! *Wallich*. Sikkim! alt. 13,000–17,000 ped., *J. D. H.* (fl. Jun.–August.) (v. v.)

Minor et robustior quam *S. micrantha*. *Petoli* lati, in laminam sensim dilatati. *Scapus* 1–10-florus, robustus v. gracilis. *Calycis* tubus interdum elongatus capsulam semivestiens, lobi forma varii. *Flores* ½–¾ poll. lati, albi. *Capsula* nunc ½ poll. longa, crassa, castanea; stylis 2 crassis recurvis.

§ VII. *HIRCULUS*. *Caules* foliosi. *Folia* varia. *Flores* lutei. *Sepala* libera, erecta v. demum patula v. reflexa.

a. *Flagelliferæ*. *Stolones filiformes*. *Calyces erecti*, v. in *S. Brunoniana patentes*.

16. *SAXIFRAGA FLAGELLARIS* (*Willd. & Sternb. Rev. Sax.* 25. t. 6). Glanduloso-pubescent, stolonibus filiformibus apice proliferis, foliis lineari- v. ovato-lanceolatis glanduloso-ciliatis radicalibus rosulatis, caulinis numerosis, floribus corymbosis, sepalis lineari-oblongis erectis.

a. Foliis ciliatis serratisve mucronatis. *S. mucronulata*, *Royle*, *Ill.* p. 227.

β. Foliis spinuloso-ciliatis aristatis. *S. spinulosa*, *Royle*, *Ill.* p. 227. t. 50. f. 2.

*Hab.* Himalaya et Tibetia alpina, alt. 10,000–17,000 ped. a Sikkim! *J. D. H.* ad Kunawur! *Royle*, &c. Ladak! *Thomson*. (fl. Jul.) (v. v.)

*Distr.* Terra arctica hemisphæræ totæ borealis.

*Caulis* 1–6-uncialis. *Folia* ½–1½ unc. longa, glabra v. utrinque glandulosa, obtusa v. acuta. *Flores* erecti, flavi, subsolitarii v. corymbosi, interdum congesti. *Calyx* dense glandulosus. *Petala* magnitudine varia, 5–9-nervia.

17. *SAXIFRAGA STENOPHYLLA* (*Royle*, *Ill.* p. 227. t. 50. f. 1). Glabrata, stolonibus filiformibus proliferis, foliis lineari-oblongis obtusis glabris v. obscure glanduloso-ciliatis inferioribus rosulatis, caulinis numerosis consimilibus, floribus solitariis corymbosisve, pedicellis calycibusque erectis glanduloso-pubescentibus.—Verosimiliter varietas *S. flagellaris*.

*Hab.* Himalaya occidentali alpina. Kumaon! 11,000–15,000 ped.! *Edgeworth*, *Strachey & Winterbottom*. Kashmir, *Royle*.

A *S. flagellari* differt, glabritie, et foliis obtusis v. vix mucronulatis, non aut vix ciliatis.

18. *SAXIFRAGA PILIFERA* (Hf. & T.). Glanduloso-puberula, stolonibus filiformibus proliferis, foliis brevibus lineari-oblongis obtusis radicalibus rosulatis, floribus parvis corymbosis, calyce basi hemisphærico lobis brevibus obtusis erectis, petalis calycem vix superantibus.

*Hab.* Himalaya orientali alpina. Sikkim, alt. 14,000–15,000 ped.!

*J. D. H.* (v. v.)

Species parvula 2–4-uncialis. *Folia*  $\frac{1}{4}$ – $\frac{1}{2}$  unc. longa, crassiuscula. *Flores* iis *S. flagellaris* multoties minoribus, sub  $\frac{1}{4}$  unc. latis, breve pedicellatis.

*Calyx* brevis semisuperus. *Capsula* brevis, stylis crassis.

19. *SAXIFRAGA BRUNONIS* (Wall. Cat. 444). Glaberrima, stolonibus capillaribus non proliferis, caulibus subcæspitosis, foliis linearibus patentibus ciliatis aristatis nitidis, caulinis sparsis supremis interdum bulbiferis, caulibus gracilibus nitidis glaberrimis v. sparse glandulosis, floribus subsolitariis, calycibus glabris ovato-oblongis obtusis patulis petalis lineari-obovatis flavis multo brevioribus, capsula turgida stylis brevissimis.—*D.C. Prodr.* iv. 45.

*Hab.* Sylvis Himalayæ temperatæ et subalpinæ, alt. 7000–12,000 ped.

Simla! *Madden*, &c.; Kumaon! *Blinkworth*, &c.; Sikkim, *J. D. H.*

(fl. Jul., August.) (v. v.)

Indole florum ab aliis hujus subsectionis longe recedens, et *S. filicaulis* proxime affinis.

b. *TRACHYPHYLLUM*. Estoloniferæ. Caules *subsimplices, foliosi*. *Folia parva, sessilia, radicalia vix ulla*. *Flores subsolitarii, terminales, pedicellati, flavi*. *Calyx patens v. reflexus*.

20. *SAXIFRAGA FILICAULIS* (Wall. Cat. 445). Hispido-glandulosa, caulibus subcæspitosis rarius simplicibus rigidis flexuosis, foliis omnibus sparsis alternis lineari-lanceolatis acuminatis scaberulis marginibus recurvis axillis supremis sæpe bulbiferis, floribus terminalibus solitariis pedicellatis sepalisque lineari-oblongis glandulosis, petalis obovato-spathulatis 3-nerviis, stylis gracilibus.—*D.C. Prodr.* iv. 46.

*Hab.* Himalaya occidentali temperata, alt. 7000–10,000 ped. Kumaon! *Blinkworth*, &c.; Simla! *Madden*, &c.; Kulu! *Edgeworth*. (fl. Aug., Sept.) (v. v.)

*Caules* spithamæi, basi bulbiferi. *Folia*  $\frac{1}{3}$  unc. longa, subsquarrosa. *Flores*  $\frac{1}{3}$ – $\frac{1}{2}$  unc. lati.

21. *SAXIFRAGA BRACHYPODA* (Don, Linn. Trans. xiii. 378). Glaberrima, caulibus simplicibus foliosis, foliis nitidis erecto-patentibus reflexisve subulato-lanceolatis acuminatis basi cordato-semiamplexicaulibus integerrimis ciliatisve, axillis interdum bulbiferis, pedicello gracili terminali 1-floro glaberrimo v. glanduloso, sepalis ovatis acuminatis, petalis late obovatis flavis, stylis graciliusculis strictis.—*Don*,

*Prodr.* 209; *D.C. Prodr.* iv. 46. *S. glandulosa*, *Wall. Cat.* 442; *D.C. Prodr.* iv. 45.

*Hab.* Sylvis Himalayæ temperatæ et subalpinæ, alt. 9000–13,000 ped. Kumaon! *Blinkworth*; Nepal! *Wallich*; Sikkim! *J. D. H.*; Bhotan! *Griffith.* (fl. August.) (v. v.)

Habitus fere *Lycopodii* ob folia subimbricata interdum reflexa et deorsum imbricata. *Folia*  $\frac{1}{3}$  unc. longa; bulbillis interdum squarrosis. *Flores*  $\frac{1}{3}$  unc. diametr.

22. *SAXIFRAGA FIMBRIATA* (*Wall. Cat.* 443). Caule superne glanduloso hispidulo rigido simplici, foliis patentibus rigidis nitidis sessilibus subdensis subulato-lanceolatis aristato-acuminatis basi cordatis spinuloso-ciliatis axillis proliferis bulbiferis, pedicellis rigidis terminalibus solitariis binisve sepalisque oblongis setoso-glandulosis, petalis late obovatis, stylis strictis graciliusculis.—*D.C. Prodr.* iv. 45.

*Hab.* Himalaya alpina et temperata, alt. 11,000–14,000 ped., Kumaon! *Blinkworth*, &c.; Nepal! *Wallich*; Sikkim, *J. D. H.* (fl. Jul.) (v. v.)

*S. brachypodæ* valde affinis sed major, foliis majoribus latioribus basi non semi-amplexicaulibus, cartilagineo-marginatis et longe spinuloso-ciliatis. *Flores* majores.

23. *SAXIFRAGA HISPIDULA* (*Don in Linn. Trans.* xiii. 380). Pubescenti-pilosa v. hispidula, caule gracili flexuoso laxefoliato, foliis sessilibus oblongo-lanceolatis acutis integerrimis v. grosse 1–2-dentatis utrinque pubescentibus axillis interdum bulbiferis, pedicellis solitariis terminalibus 1-floris sepalisque ovatis acutis hispido-glandulosis, petalis late obovatis calyce duplo longioribus.—*S. Evolvuloides*, *Wall. Cat.* 447; *D.C. Prodr.* iv. 46.

*Hab.* Himalaya centrali et orientali alpina. Nepal! *Wallich*; Sikkim, alt. 13,000–15,000 ped., *J. D. H.* (fl. August.) (v. v.)

Species distinctissima. *Caules* 4–6 unc. longi. *Folia*  $\frac{1}{4}$ – $\frac{2}{3}$  unc. longa, 2 ad  $2\frac{1}{2}$  plo longiora quam lata, opaca, sessilia, basi angustata. *Flores*  $\frac{1}{3}$  unc. lati, crocei.

c. *Cæspitosi*. *Caules scapive erecti, laxefoliati, 1-flori*. *Folia, non secus ramos omnes imbricata, radicalia petiolata, caulina sessilia*. *Sepala patula v. erecta*. *Petala flava* (vide *S. Hirculus* in subsectione sequenti).

24. *SAXIFRAGA PALPEBRATA* (*Hf. & T.*). Dense cæspitosa, glanduloso-pubescens, caulibus scapisve erectis 1-floris, foliis longe ciliatis radicalibus petiolatis spathulatis obtusis, caulinis sessilibus lineariblongis obtusis, flore subsessili majusculo, sepalis late oblongis obtusis ciliatis petalis obovatis aureis  $\frac{1}{2}$  brevioribus, ovario oblongo-conico, stylis brevissimis.—Ad *S. Hirculus* tendit.

*Hab.* Himalaya alpina. Kumaon, 13,000 ped., *Strachey & Winterbottom*; Sikkim, alt. 13,000–15,000 ped.! *J. D. H.* (fl. August.) (v. v.)

Species pulchella 2-3-uncialis, cæspites latos amplos floribus amplis opertos efficiens. *Folia* radicalia  $\frac{1}{2}$  unc. longa, caulina breviora longius ciliata. *Flores* lati,  $\frac{1}{3}$  unc. diametr.

25. *SAXIFRAGA CORDIGERA* (Hf. & T.). Dense cæspitosa, glanduloso-pilosa, caulibus scapisve erectis 1-floris, foliis longe ciliatis radicalibus petiolatis spathulatis obtusis caulinis ovato-cordatis, flore subsessili majusculo, sepalis late oblongis obtusis ciliatis petalis obovatis aureis  $\frac{1}{2}$  brevioribus, ovario late conico, stylis brevissimis.

*Hab.* Himalaya orientali alpina, Nepal et Sikkim, alt. 12,000-14,000 ped. ! *J. D. H.* (fl. Aug.) (v. v.)

*S. palpebrata* simillima, et vix differt, nisi foliis radicalibus longius petiolatis, caulinisque cordatis.

26. *SAXIFRAGA SAGINOIDES* (Hf. & T.). Densissime cæspitosa, caulibus inter folia scapisque laxè pilosis, foliis densissime imbricatis anguste linearibus longe membranaceo-vaginantibus obtusiusculis recurvo-patentibus vaginis ciliatis, scapis brevibus 1-floris, foliis parvis linearibus sepalisque lineari-oblongis obtusis eglandulosis, petalis linearibus lineari-oblongisve sepalis paulo longioribus.

*Hab.* Himalaya alpina, Kumaon, alt. 13,000 ped. ! *Strachey & Winterbottom* ; Sikkim, alt. 14,000-18,000 ped. ! *J. D. H.* (fl. August.) (v. v.)

Species submuscoidea, cæspites latos 1 ped. et ultra læte virides efficiens, floribus parvis aureis stellata. *Folia* glaberrima, coriacea sed non rigida,  $\frac{1}{4}$ - $\frac{1}{3}$  unc. longa, petiolo vaginante scarioso brunneo æquilongo, marginibus recurvis planisve. *Scapi*  $\frac{1}{4}$  unc. longi, pilis brunneis laxè vestiti. *Flores*  $\frac{1}{6}$  unc. lati. *Ovarium* conico-oblongum, sæpe abortivum ; stylis subulatis recurvis.—Inter formas minimas alpinas *S. Hirculi* perplurimas vidimus ab *S. saginoides* ægre distinguendas.

27. *SAXIFRAGA ARISTULATA* (Hf. & T.). Dense cæspitosa, caulibus scapisque laxè pilosiusculis, foliis radicalibus anguste linearibus rigidis nitidis integerrimis glaberrimis marginibus recurvis apice arista decidua terminatis, scapis unifloris superne glanduloso-pilosis, sepalis lineari-oblongis glaberrimis, petalis obovatis orbiculatisve.

*Hab.* Himalaya orientali alpina, Sikkim, alt. 16,000 ped. ! *J. D. H.* (fl. Aug., Sept.) (v. v.)

Inter *S. saginoidem* et *S. Brunonis* et *S. filicaulem* oscillat. Habitus *S. saginoidis* et *S. Brunonis*, textura et flores *S. filicaulis* et *S. Brunonis*, sed capsula non inflata et folia non ciliata. A *S. saginoide* conspicue differt foliis rigidis, arista decidua terminatis, marginibus recurvis, scapis glandulosis petalisque latioribus.

28. *SAXIFRAGA LYCHNITIS* (Hf. & T.). Cæspitosa, tota glanduloso-pilosa v. pubescens, foliis radicalibus ovatis breve petiolatis obtusis integerrimis caulinis sessilibus lineari-oblongis, flore magno nutante demum erecto, calyce oblongo atro-tomentoso segmentis erectis lineari-oblongis obtusis, petalis anguste lineari-elongatis.



*Hab.* Himalaya alpina, Kumaon, alt. 14,700 ped. ! *Strachey & Winterbottom*; Sikkim, alt. 14,000–16,000 ped. ! *J. D. H.* (fl. Jul.) (v. v.)

*Species distinctissima habitu fere Lychnidis apetalæ. Color luridus. Scapi* exemplaribus e Kumaon pollicares, e Sikkim 4-pollicares. *Folia* radicalia conferta,  $\frac{1}{2}$  unc. longa, opaca, enervia; petiolo breviusculo membranaceo-marginato ciliato. *Scapus* firmus. *Flos* pro planta majusculus. *Calyx*  $\frac{1}{2}$  unc. longus, lobis tubo triplo longioribus. *Petala* marcescentia  $\frac{1}{2}$ – $\frac{1}{3}$  unc. longa, interdum pollicaria et ligulata. *Stamina* filamentis filiformibus, antheris parvis. *Capsula* conico-oblonga, calyce inclusa, truncata, stylis 2 brevibus divaricatis terminata.

d. Cæspitiosi. Caules scapive erecti, laxè foliati, multiflori (in *S. Hirculus* 1–3 flori). Folia non imbricata, radicalia petiolata. Sepala in omnibus patula. Petala flava.

29. *SAXIFRAGA HIRCULUS* (*Linn. Sp. Pl.* 575). Caule scapove superne laxè villosa, foliis radicalibus petiolatis lanceolato-spathulatis glaberrimis petiolis interdum ciliatis, caulinis sessilibus petiolatisve, floribus 1–3, sepalis late oblongis obtusis, petalis obovatis orbiculatisve, capsula conico-oblonga, stylis brevissimis divaricatis.—*D.C. Prodr.* iv. 45; *Engl. Bot.* t. 1009.

β. Petalis 5-nerviis basi nudis. *S. Hirculoides*, Dne. *Plant. Jacq.* 67. t. 78. fig. 1.

γ. Floribus dense corymbosis parvis, omnibus masculis ovarii imperfectis.

*Hab.* Himalaya orientali et Tibetia occidentali alpina. Kunawur, 15,000–16,000 ped. ! *T. Thomson*; Sikkim, alt. 14,000 ped. ! *J. D. H.*; Gugi, 17,000 ped. ! *Strachey & Winterbottom*; Ladak ! Nubra ! &c., alt. 15,000–17,000 ped. ! *Thomson*; Piti, *Jacquemont*. (fl. Jul.–Sept.) (v. v.)

*Distr.* Terris arcticis hemisphæræ totæ borealis, alpihus Europæ totius, Caucasi, Soongariæ.

30. *SAXIFRAGA NUTANS* (*Hf. & T.*). Caule erecto multifloro superne pedicellis calycibusque dense pubescenti-glandulosis, foliis radicalibus longe petiolatis elliptico-oblongis obtusis 3–5-nerviis ciliatis, caulinis sessilibus oblongis obtusis, floribus subracemosis confertis nutantibus, sepalis erectis lanceolato-oblongis glandulis atris, petalis spathulatis vel anguste lineari-oblongis obtusis pallide flavis.

*Hab.* Himalaya orientali subalpina. Sikkim, alt. 10,000–12,000 ped. ! *J. D. H.* (fl. August.) (v. v.)

*Species insignis, spithamæa, caule erecto foliato. Folia* radicalia cum petiolo 2–3 unc. longa, laxè ciliata, interdum pilosula. *Racemi* terminales 7–12-flores. *Flores* fere  $\frac{1}{2}$  unc. longi. *Petala* calyce vix bis longiora. *Ovaria* exemplaribus nostris ut videtur imperfecta. *Stamina* inæqualia, filamentis filiformibus.

31. *SAXIFRAGA VISCIDULA* (*Hf. & T.*). Tota glanduloso-pubescent, caule inferne laxè piloso, foliis inferioribus petiolatis spathulato-lanceo-

latis subacutis, superioribus sessilibus oblongis, floribus solitariis corymbosisve, pedunculis calycibusque dense glandulosis, sepalis oblongis obtusis, petalis oblongo-spathulatis obtusis 5-7-nerviis marginibus eroso-ciliolatis glandulosis sepalis triplo longioribus.

*Hab.* Himalaya orientali alpina. Sikkim, alt. 13,000-15,000 ped. ! *J.D.H.* (fl. August.) (v. v.)

*Caulis* 2-3-pollicaris, flexuosus, foliosus. *Folia* inferiora  $\frac{1}{2}$  unc. longa. *Flores* pro planta magni,  $\frac{1}{2}$  unc. longi. *Petala* erecto-patentia glandulis marginalibus interdum atris. *Ovarium* breviter oblongo-conicum, stylis parallelis rectis.

32. *SAXIFRAGA CORYMBOSA* (*Hf. & T.*). Caule gracili laxe foliato inferne glaberrimo superne pedunculis pedicellisque sparse glandulosis, foliis radicalibus longe petiolatis ovato-lanceolatis glaberrimis v. sparse pilosiusculis, caulinis sessilibus semiamplexicaulibusque, floribus erectis corymbosis, sepalis patulis v. reflexis oblongis glaberrimis glandulosisve, petalis patentibus glaberrimis.

a. Foliis radicalibus latioribus pilosiusculis opacis, caulinis basi attenuatis, sepalis glandulosis v. glaberrimis.

β. Foliis nitidis radicalibus minoribus angustioribus, caulinis basi cordato-semi-amplexicaulibus, calycibus glaberrimis. An species diversa?

*Hab.* Himalaya orientali temperata et subalpina, Sikkim, alt. 10,000-14,000 ped. ! *J.D.H.* (fl. August.) (v. v.)

Inter *S. Hirculum* et *diversifoliam* media : a priori differt præcipue caule superne pedicellisque non villosis sed glandulosis, floribus corymbosis ; —a posteriore caulibus gracilibus, foliis angustioribus, floribusque multo minoribus.

33. *SAXIFRAGA DIVERSIFOLIA* (*Wall. Cat.* 452). Elata, caule robusto foliato superne glanduloso, inferne glaberrimo v. piloso, foliis longe petiolatis late ovatis lanceolatisve, caulinis late ovatis sessilibus, floribus corymbosis, bracteis calycibusque glandulosis, petalis obovatis ungue brevi basi interdum glanduloso-setosis.—*D.C. Prodr.* iv. p. 44 ; *Hook. Lond. Journ. Bot.* iv. p. 638. t. 21.

a. *lanceolata* (*D.C. l.c.*), foliis radicalibus elliptico- v. ovato-lanceolatis, caulinis ciliolato-glandulosis basi angustatis v. brevissime cordatis.

β. *parnassiaefolia* (*D.C. l.c.*), foliis radicalibus ovato-cordatis petiolis et pagina inferiore glabris v. hirsutis, caulinis late cordato-ovatis semiamplexicaulibus. *S. parnassiaefolia*, Don in Linn. Trans. xiii. 405 (male) ; *D.C. Prodr.* iv. 25.

γ. *Moorcroftiana* (*D.C. l.c.*), caule robustiore, foliis radicalibus ovatis cordatisve, caulinis late cordato-amplexicaulibus. *S. Moorcroftiana*, Wall. Cat. 453.

*Hab.* Himalaya tota subalpina et temperata copiosissime, a Sikkim ! ad Kashmir ! alt. 8000-15,000 ped. (fl. August., Sept.) (v. v.)

Planta variabilis, statura copiaeque florum insignis.

34. *SAXIFRAGA LATIFLORA* (Hf. & T.). Caule erecto foliato sparse glanduloso-piloso, foliis radicalibus petiolatis ovato-ellipticis, caulinis majoribus amplis late ovatis basi angustatis sub-decurrentibus obtusiusculis, floribus solitariis paucisve maximis, calyce basi villosa, sepalis ovato-lanceolatis obtusis petalis ovato-oblongis paulo brevioribus.

*Hab.* Himalaya orientali alpina, Sikkim, alt. 12,000–14,000 ped.! *J. D. H.* (fl. August.) (v. v.)

*S. diversifoliae* proxima et forma abnormis, sed foliis caulinis amplis et floribus fere pollicem latis diversissima.—*Caules* 4–5 unc. alti, robusti, glabriusculi. *Folia* radicalia pauca, parva; caulina  $1\frac{1}{2}$  unc. longa,  $\frac{1}{2}$ –1 unc. lata. *Petala* glaberrima, basi non appendiculata. *Ovarium* et *stamina* ut in *S. diversifolia*.

35. *SAXIFRAGA UMBELLULATA* (Hf. & T.). Parvula, caulibus cæspitosis pedunculis pedicellis calycibusque dense glanduloso-pubescentibus, foliis carnosissimis confertis rosulatis spathulatis glabriusculis, caulibus scapisve medio foliatis foliis glandulosis lineari-oblongis, superne corymboso-paniculatis, sepalis lineari-oblongis obtusis petalis obovatis dimidio brevioribus.

*Hab.* Himalaya orientali alpina, Sikkim, alt. 12,000–14,000 ped.! *J. D. H.* (fl. Jul.) (v. v.)

Species singularis *Crassulam* parvam referens, congeneri nulli affinis.

*Caules* brevissimi, scapis foliatis pollicaribus. *Folia* valde carnosissima, recurva, densissime rosulata,  $\frac{1}{3}$ – $\frac{1}{2}$  unc. longa, glabra v. sparse ciliata, petiolo crassiusculo, lamina parva obtusa. *Scapus* ascendens, subrigidus, basi nudus, supra medium foliatus, foliis linearibus obtusis patulis glandulosis, ibi subumbellatim ramosus, ramis pedicellisve  $\frac{1}{2}$ -pollicaribus flexuosis 1–2-floris interdum bracteatis. *Flores* erecti, aurei, sub  $\frac{1}{4}$  poll. lati; petala erecto-patentia. *Ovarium* breve, stylis brevibus.

*e.* *Caules* dense cæspitosi ramosi, foliis imbricatis parvis crassiusculis densissime obtecti. *Flores* solitarii, flavi, terminales, sessiles, v. pedicello nudo. *Sepala* patula v. reflexa, rarius erecta.

36. *SAXIFRAGA JACQUEMONTIANA* (Dne. in *Plant. Jacq.* 68. t. 78. f. 2). Densissime cæspitosa, glanduloso-puberula, foliis sessilibus dense imbricatis lineari-oblongis apice rotundatis glanduloso-ciliolatis pubescentibusque, floribus sessilibus pedicellatisve pedicello calyceque reflexo glanduloso, petalis lineari-oblongis, ovariis stylisque brevibus.

*Hab.* Himalaya alpina. Lahul! Hay; Kunawur, *Jacquemont*; Kumaon! 13,000 ped., *Strachey & Winterbottom*; Sikkim, alt. 15,000–18,000 ped.! *J. D. H.* (fl. August., Sept.) (v. v.)

*Radix* cæspitibus vetustioribus sublignosus, elongatus, divisus. *Rami* 1–2 poll. longi, cum foliis  $\frac{1}{4}$  unc. diametr. *Flores* expansi ramis paulo latiores.

37. *SAXIFRAGA STELLA-AUREA* (Hf. & T.). Cæspitosa, ramis interdum elongatis foliis dissitis, glabra v. parce glanduloso-puberula, foliis laxè imbricatis carnosulis oblongis apice rotundatis glaberrimis ciliolatisve, pedicellis terminalibus subelongatis glanduloso-pubescentibus 1-floris, calycibus glaberrimis, sepalis oblongis obtusis patentibus demum reflexis, capsula brevi late conica, stylis longiusculis subrecurvis.  
*Hab.* Himalaya et Tibetia occidentali alpina. Kumaon, alt. 14,000 ped. ! *Strachey & Winterbottom*; Tibetia occid. ad Pangong, alt. 17,000–18,000 ped. ! *H. Strachey* (15); Sikkim, alt. 15,000–17,000 ped. ! *J. D. H.* (fl. Aug., Sept.) (v. v.)

*S. Jacquemontianæ* valde affinis, sed minor, glabrior, laxius cæspitosa, pedicellis longioribus, sepalisque non aut vix ciliolatis.

38. *SAXIFRAGA MICROPHYLLA* (Royle in *Herb. Benth.*). Perpusilla, glaberrima, laxè cæspitosa, foliis laxè imbricatis lineari-oblongis obtusis carnosulis, pedicellis terminalibus gracilibus unifloris glanduloso-puberulis, calyce hemisphærico, sepalis erectis glaberrimis coriaceis, petalis oblongis coriaceis sepalis æquilongis, antheris subexsertis, stylis brevibus.

*Hab.* Himalaya occidentali alpina. Kumaon ! (Royle) ad Barji-kang, alt. 14,500 ped. ! *Strachey & Winterbottom*.

Species omnium minima, cæspites pollicem latos efficiens. *Caules* laxè ramosi,  $\frac{1}{4}$  unc. longi. *Folia* subfasciculata,  $\frac{1}{8}$  unc. longa. *Pedicellus*  $\frac{1}{4}$  unc. longus. *Flores* iis *Saginæ* subsimiles, interdum apetalæ ? *Petala* coriacea. *Filamenta* subfiliformia. *Capsula* nunc conica, stylo nullo, stigmate capitato; nunc bifida, stylis brevibus divaricatis, stigmatibus capitatis.

39. *SAXIFRAGA PERPUSILLA* (Hf. & T.). Dense cæspitosa muscoidea, ramis brevibus, foliis densissime imbricatis oblongis apice rotundatis basi lata sessilibus concavis marginibus fimbriato-ciliatis cæterum glaberrimis, pedicellis 1-floris glanduloso-pubescentibus, sepalis late oblongis obtusis ciliolatis petalis lineari-oblongis aureis  $\frac{1}{3}$  brevioribus, stylis brevibus divaricatis.

*Hab.* Himalaya orientali alpina, Sikkim, alt. 16,000–17,000 ped. ! *J. D. H.* (fl. Sept.) (v. v.)

Cæspites *S. hemisphæricæ* subsimiles, sed folia breviora margine et sepalorum margine non scariosa, floribus sublonge pedicellatis multoties majoribus, *S. Stella-aurea* referentibus. Apices ramulorum hemisphærici,  $\frac{1}{8}$  unc. lati. *Pedicelli*  $\frac{1}{8}$ – $\frac{1}{3}$  unc. longi. *Flores*  $\frac{1}{8}$  unc. lati. *Capsula* sepalis duplo longior.

## Gen. II. CHRYSOSPENIUM, L.

### § 1. Folia opposita.

1. *CHRYSOSPENIUM NEPALENSE* (Don, *Prodr. Flor. Nep.* 210). Glaberrimum, caule ascendente ramoso, foliis oppositis ovato- v. reniformi-cuneatis interdum subcordatis obtusis crenatis, floribus subses-

silibus, seminibus parvis glaberrimis.—D. C. Prodr. iv. 48. (An *C. oppositifolium*, var. ?)

*Hab.* Himalaya centrali et orientali temperata. Nepal! *Wallich*; Sikkim, alt. 7000–10,000 ped., *J. D. H.* (fl. Mai., Jun.) (v. v.)

*Distr.* America boreali occidentali et Kamtchatka.

*C. oppositifolio* simillima, sed folia manifeste et regulariter crenata, lobulis latiusculis. *Semina* nitida (opaca fid. D.C.).

2. *CHRYSOSPLENIUM TRICHOSPERMUM* (*Edgeworth, MSS.*). Glaberrimum, caule ascendente ramoso, foliis oppositis ovato-oblongis obtusis basi cuneatis subserratis, floribus pedicellatis majusculis, seminibus magnis nitidis pilosis.

*Hab.* Himalaya occidentali temperata. Kumaon, alt. 7000–8000 ped.! *Edgeworth, Madden, Strachey & Winterbottom.*

*C. Nepalensi* major, robustior, foliis magis oblongis, floribus pedicellatis majoribus, seminibus magnis laxè patentim pilosis.

## § 2. Folia alterna.

3. *CHRYSOSPLENIUM ALTERNIFOLIUM* (*Linn. Sp. Pl.* 569). Suberectum, glaberrimum, caule longe nudo, foliis radicalibus longe petiolatis reniformi-rotundatis crenato-lobulatis lobulis latis retusis, superioribus breve petiolatis cordato-rotundatis, floribus sessilibus, seminibus nitidis glabris.—*Engl. Bot.* t. 54.

*Hab.* Himalaya orientali alpina, Sikkim, alt. 12,000–15,000 ped.! *J. D. H.* (fl. August.) (v. v.)

*Distr.* Cum planta Europæa omnino quadrat.

4. *CHRYSOSPLENIUM TENELLUM* (*Hf. & T.*). Glaberrimum, caulibus filiformibus procumbentibus intertextis, foliis alternis (parvis) late reniformi-rotundatis profunde cordatis late crenato-lobulatis, floribus sparsis breve pedicellatis, seminibus glaberrimis politis nitidissimis.

*Hab.* Himalaya occidentali temperata. Kumaon, *Royle*, alt. 10,000 ped.! *Strachey & Winterbottom.*

Species pusilla, *Hydrocotylem* referens. *Caules* sicco filiformes. *Folia*  $\frac{1}{4}$ – $\frac{1}{3}$  unc. diametr., longe petiolata.

5. *CHRYSOSPLENIUM CARNOSUM* (*Hf. & T.*). Glaberrimum, cæspitosum, radicibus crasse fibrosis, caulibus erectis crassis ramosis basi foliis squamæformibus laxè vaginatis, foliis alternis breve late petiolatis cuneato-ovatis obtusis crenato-dentatis, floribus sessilibus.

*Hab.* Himalaya orientali alpina, Sikkim, alt. 14,000–15,000 ped.! *J. D. H.* (v. v.) (fl. August.)

Luride virens, caulibus 2–3-pollicaribus, radicibus 3–5-pollicaribus descendentibus fibrosis. *Folia* radicalia 0, caulina carnosæ,  $\frac{1}{3}$ – $\frac{1}{2}$  unc. longa, infra medium late cuneata integerrima. *Flores* luridi, calycis lobis purpureis. *Semina* immatura.

6. *CHRYSPLENIUM LANUGINOSUM* (Hf. & T.). Caulibus carnosius suberectis ramosis petiolisque laxè lanuginosis, foliis alternis inferioribus ovatis ovato-cordatisve obtusis obscure crenatis utrinque laxè pilosis superioribus longè petiolatis reniformibus supremis glabratiss, floribus brevè pedicellatis.

*Hab.* Himalaya orientali temperata. Bhotan! *Griffith* (No. 2049).

7. *CHRYSPLENIUM GRIFFITHII* (Hf. & T.). Glaberrimum, caulibus longè nudis simplicibus superne divisiss, foliis alternis longè petiolatis late reniformi-cordatis profunde lobulatis, lobulis oblongis obtusiss, floribus parvis brevè pedicellatis.

*Hab.* Himalaya orientali temperata. Bhotan! *Griffith* (No. 2051).

Species elegans, 3-4-uncialis, caule gracili longè nudo, ima basi squamoso. *Folia*  $\frac{1}{3}$  unc. lata, margine in lobulos apiculatos 6-12 obtusos incisa, sinubus acutiss. *Flores* parvi, viridess.

### Gen. III. TIARELLA, L.

1. *Tiarella polyphylla* (Don, Prodr. 210), D.C. Prodr. iv. 51.

*Hab.* Himalaya centrali et orientali temperata. Nepal! *Wallich*; Sikkim, alt. 7000-10,000 ped.! *J. D. H.*; Bhotan! *Griffith*. (fl. Jun.) (v. v.)

### Gen. IV. VAHLIA, Th.

1. *Vahlia oldenlandioides*, Roxb. Hort. Bengal. 86; Flor. Ind. ii. 89; Wight & Arn. Prodr. 364; Wight, Ill. ii. t. 115. *V. silenoides*, A. DeCand. in D.C. Prodr. iv. 54. *V. Oldenlandiæ*, D.C.l. c.

*Hab.* In Peninsula Indiæ tropicæ; Carnatic! Orissa! *Roxburgh*, &c.

*Distr.* Africa tropica boreali; Senegalia! et Nubia!

2. *Vahlia viscosa*, Roxb. Hort. Beng. 86; Flor. Ind. ii. 89; Wight & Arn. Prodr. 364. *V. Weldenii*, Reichb. Hort. Bot. 91; D.C. Prodr. iv. 53. *V. sessiliflora*, D.C. Prodr. iv. 54.

*Hab.* In Peninsula Indiæ tropicæ; Maisor! et Carnatic! *Roxburgh*, &c.; Bundelkhund! *Edgeworth*; planitie Gangetica superiore et Punjab! *Thomson*, &c.; Scinde! *Vicary*.

*Distr.* Africa tropica boreali; Senegalia! Nubia! Ægypto!

### Gen. V. ASTILBE, Ham.

1. *Astilbe rivularis*, Hamilt. ex Don, Prodr. Fl. Nep. 210; D.C. Prodr. iv. 51. *Spiræa barbata*, Cambess. in Plant. Jacq. *S. triternata*, Wall. Cat. 706.

*Hab.* In Himalaya temperata, alt. 5000-9000 ped., frequens a Sikkim! ad Simla! *Hamilton*, &c. Montibus Khasia, alt. 5000-7000 ped.! *Griffith*, &c. (fl. Jun.) (v. v.)

*Distr.* Java!

2. *Astilbe rubra*, Hf. & T. Bot. Mag. 4959.

*Hab.* Montibus Khasiæ regione temperata, alt. 5000-6000 ped.! *Griffith*, &c. (fl. August.) (v. v.)

Gen. VI. NEILLIA, *Don* (cf. *Adenilema*, *Blume*).

1. *Neillia thyrsoflora*, *Don*, Prodr. 228; D.C. Prodr. ii. 547; *Wall.* Cat. 698. *N. virgata*, *Wall.* Cat. 7108.

*Hab.* In Himalaya centrali et orientali temperata. Nepal! *Wallich*; Sikkim, alt. 5000-8000 ped.! *J. D. H.*; Montibus Khasia, alt. 5000-7000 ped.! *Wallich*, &c. (fl. Jun.) (v. v.)

2. *Neillia rubiflora*, *Don*, l. c.; D.C. l. c.

*Hab.* Himalaya centrali et orientali temperata. Nepal! *Wallich*; Sikkim, alt. 8000-10,000 ped.! *J. D. H.* (fl. Jul.) (v. v.)

Gen. VII. HYDRANGÆA, *L.*

1. *Hydrangæa altissima*, *Wall.* Tent. Flor. Nep. t. 50; D.C. Prodr. iv. 14.

*Hab.* In Himalaya temperata, alt. 6000-10,000 ped.; frequens a Bhotan! *Griffith*, ad Simla! *T. Thomson*. (fl. Mai.) (v. v.)

2. *Hydrangæa vestita*, *Wall.* Tent. Flor. Nep. t. 49, excl. var.  $\beta$ ; D.C. Prodr. iv. 14. *H. heteromalla*, *Don*, Prodr. Fl. Nep. 211.

*Hab.* In Himalaya temperata, alt. 6000-10,000 ped., frequens a Bhotan! *Griffith*, ad Kumaon! *Strachey & Winterbottom*, &c. (fl. Jul.) (v. v.)

*Folia* late v. anguste ovata v. ovato-lanceolata, subtus dense pubescenti-tomentosa, supra glabra v. puberula. *Rami* glabri v. tomentosi; ramulis tomentosis. *Sepala* in fl. imperfectis 4, rotundata v. ovata, integerrima. *Styli* in conum crassum ad medium coaliti, dein erecti, liberi, validi.

3. HYDRANGÆA KHASIANA (*Hf. & T.*). Foliis late ovato-cordatis argute denticulatis subtus dense cano-tomentosis, ramulis robustis corymbisque amplis ramosis densifloris subscaberulo-tomentosis, sepalis fl. imperfect. 4 late elliptico-oblongis obtusis integerrimis, stylis in conum latum connatis supra medium liberis erectis robustis.—An forma *H. vestitæ*?

*Hab.* Montibus Khasia, regione temperata rara ad Surureem et Kalapance, alt. 5000-6000 ped.! (fl. Jun.) (v. v.)

Ab *H. vestita* differt habitu robustiore, foliis multo latioribus, basi cordatis.

4. *Hydrangæa aspera*, *Don*, Prodr. 211. *H. vestita*, var. *fimbriata*, *Wall.*? Tent. Flor. Nep. t. 49.

*Hab.* In Himalaya temperata, alt. 6000-7000 ped. Nepal! *Wallich*; Kumaon! *Strachey & Winterbottom*; Sikkim! *J. D. H.* (fl. Jun.) (v. v.)

*Rami ramulique* appresse puberuli v. tomentosi. *Folia* lanceolata, argute serrata, subtus cano-tomentosa. *Corymbi* laxiflori; floribus exterioribus longe pedicellatis. *Sepala* floribus imperfectis 4-5, obovato-oblonga, apiculata, integerrima v. serrata. *Capsulæ* globosæ, stylis liberis, recurvis.

5. HYDRANGÆA STYLOSA (*Hf. & T.*). Ramis gracilibus glabris, ramulis corymbisque puberulis, foliis ellipticis sinuato-dentatis utrinque

glabratis nervis subtus puberulis, corymbo paucifloro, fl. imperfectis sepalis 4-5 late cuneato-oblongis grosse sinuato-crenatis, stylis liberis capsulæ æquilongis rectis subulatis.

*Hab.* In Himalaya orientali temperata. Sikkim, alt. 8000 ped. ! *J. D. H.* (fl. Jun.) (v. v.)

*Exemplaria manca.* *Folia* 2-pollicaria, petiolata, submembranacea.

6. *HYDRANGÆA ROBUSTA* (*Hf. & T.*). Ramulis robustis corymbis petiolisque pubescentibus, foliis longe petiolatis (petiolo superioribus alato) late ovatis ovato-cordatisve margine fimbriato-dentatis, superne asperulis subtus pubescenti-tomentosis, corymbis laxis multifloris, sepalis fl. imperfectis 4-5 late ovatis grosse serrato-dentatis, stylis liberis recurvis.

*Hab.* In Himalaya orientali temperata. Sikkim, alt. 5000-7000 ped. ! *J. D. H.* (fl. August.) (v. v.)

Arbor parva, ramis robustis. *Folia* 3-4 unc. longa, petiolo 2-3-unciali, basi interdum valde inæqualia, pagina superiore pilis rigidis asperula, costa venisque primariis pubescentibus, suprema sæpius petiolo brevior alato, ala fimbriato-dentata. *Sepala* fl. imperfect. alba, magna,  $\frac{3}{4}$ -1 unc. longa, interdum lobata, corymbis luxuriantibus minora, subserrata v. imo integerrima.

#### Gen. VIII. ADAMIA, *Wall.*

*Cyanites*, *Reinwardt.* *Dichroa*, *Lour.?*

1. *Adamia cyanea*, *Wall. Tent. Flor. Nep.* 46. t. 36 ; *Plant. As. Rar.* t. 213. *Hydrangea anomala*, *Don, Prodr.* 211.—*Cf. Cyanites sylvatica*, *Reinwardt*, in *Blume, Bijl.* 921, et *cf. C. chinensis*, *Gardn. (versicolor, Fortune)*, quæ differt floribus majoribus.

*Hab.* In Himalaya centrali et orientali temperata. Nepal ! *Wallich.* Sikkim, alt. 6000-8000 ped. ! *J. D. H.* Bhotan ! *Griffith.* Mont. Khasia, alt. 4000-5000 ped., *J. D. H. & T. T.* (fl. Jun.) (v. v.)

*Distr.* Java ? China ?

#### Gen. IX. PILEOSTEGIA, *Hf. & T.*

1. *Pileostegia viburnoides*, *Hf. & T.* (Tab. II.)

*Hab.* Montibus Khasia, regione subtropica, *Lobb.* Prope Nunklow, alt. 3000-5000 ped. ! *J. D. H. & T. T.* (fl. Jul.) (v. v.)

Frutex glaberrimus. *Rami* teretes. *Folia* opposita, petiolata, ovato-lanceolata, glaberrima, obscure versus apices sinuato-serrata, coriacea, penninervia, supra nitida. *Panicula* terminalis, ramosa, ramis suboppositis subcorymbosis ramulisque puberulis. *Floribus* sub  $\frac{1}{2}$  unc. diametr. *Stamina* elongata. *Stylus* brevis. (Tab. II.)

*Fig. 1*, Flos ; *2*, id. corolla delapsa ; *3*, corolla ; *4*, stamen ; *5*, ovarium, calyx et stylus ; *6*, ovarium verticaliter sectum ; *7*, id. transverse sectum ; *8*, semen immaturum—omnes sub lente aucti.





*Pileostegia viburnoides*, Hf. & T.

25  
SATUR

## Gen. X. POLYOSMA, Bl.

1. POLYOSMA WALLICHII (Bennett, *Plant. Jav. Rar.* 196). Ramulis petiolis racemisque pubescentibus, foliis oblongo-lanceolatis integerrimis serratisve subtus pubescentibus, floribus pedicellatis.—*Wall. Cat.* 8471.

*Glossoma acuminatum*, Wall. Cat.—An var. *P. integrifoliæ* Blume?

*Hab.* In Montibus Khasia regione tropica, alt. 2000–4000 ped.! *De Silva, J. D. H. & T. T.* (fl. Jun.) (v. v.)

*Distr.* Java?

2. POLYOSMA FRAGRANS (Bennett in *Plant. Jav. Rar.* 196). Foliis obovato-lanceolatis acuminatis, floribus sessilibus.—*Itea fragrans*, Wall. Cat. 8472 in parte, et in Roxb. *Flor. Ind.* ii. 420.

*Hab.* Peninsula Malayana ad Singapore! *Wallich*; Malacca! *Griffith*.

3. POLYOSMA INTEGRIFOLIA (Blume, *Bijd.* p. 659). Foliis lanceolatis acuminatis integerrimis subtus glabris, floribus pedicellatis.—*Bennett, Plant. Jav. Rar.* 196. *P. fragrans*, Wall. Cat. 8472 in parte.

*Hab.* Peninsula Malayana; ad Malacca! *Griffith*. Singapore! *Wallich*.

*Distr.* Java.

NIMMOIA, Wight = *Ameletia floribunda*.

## Gen. XI. ITEA.

1. ITEA NUTANS (Royle, *Ill.* p. 226). Foliis ovato- v. elliptico-oblongis acuminatis argute serratis, racemis terminalibus folio longioribus.

*Hab.* In Himalaya occidentali temperata. Kumaon, alt. 3000–6000 ped.! *Royle, &c.* (fl. Jul.) (v. v.)

2. ITEA MACROPHYLLA (Wall. Cat. 7200). Foliis (3–5-pollicaribus) ovato- v. obovato-lanceolatis acuminatis serratis, racemis folio brevioribus longioribusve.—*Kurrimia?* Wall. Cat. 7200.

*Hab.* In Montibus Khasia regione tropica, alt. 2000–4000 ped.! *Wallich, &c.*, et in Himalaya orientali tropica. Bhotan! *Griffith*. (fl. Jun.) (v. v.)

3. ITEA CHINENSIS (Hook. & Arn. *Bot. Beech.* 189. t. 39). Foliis (2-pollicaribus) obovatis obovato-lanceolatisve acuminatis serratis, racemis lateralibus foliis subæquilongis.—An forma *I. macrophyllæ?*

*Hab.* In Montibus Khasia regione temperata, alt. 4000–6000 ped.! *J. D. H. & T. T.* (fl. Mai.) (v. v.)

*Distr.* China.

## Nat. Ord. PARNASSIÆ.

## Gen. I. PARNASSIA, L.

This genus abounds in the temperate and alpine regions of the mountains of India, attaining 17,000 feet of elevation. We consider it to be undoubtedly more nearly allied to *Saxifragæ*

than to any other Order except *Droseraceæ*. In one curious physiological point it agrees with *Saxifraga* itself, viz. the stamens approaching the stigma by pairs, shedding their pollen and retiring, an economy common to all the species we have examined in a living state; it also agrees so remarkably with that genus in habit, that it is difficult to distinguish some of the small alpine species in their native places of growth at first sight; the petals in both are persistent, of a singularly thick and coriaceous or fleshy texture with transparent veins. Another point of resemblance with *Saxifrageæ* is the variable amount of adhesion of the calyx-tube and ovary: in all the species the ovary is almost free in a very young state, and it is more during the after-development of the fruit than of the ovary that the former becomes imbedded in the tube of the calyx. The stigmas are always free, and the very short styles also in the species with dehiscent capsules: in the half-superior fruited species with dehiscent capsules, the dehiscence takes place only above the calyx-tube, and the fruit of *P. nubicola* strongly resembles that of a *Wahlenbergia* in general appearance, though not in internal structure.

There are three principal modifications of the fruit in *Parnassia*: a superior ovoid 3-4-valved capsule, which is the structure in *P. palustris*, *P. foliata*, and several American species;—a superior trigonous coriaceous indehiscent capsule, in which the placenta are sometimes confined to the lower part of the cell, and which has a longer style than either of the other forms of capsule; this characterizes the 'Peninsular' Khasia, and a few of the Himalayan species;—and a semi-superior fruit, as in the *P. nubicola*, *P. affinis*, *P. pusilla*, and *P. ovata*; species that may possibly prove forms of one.

The structure of the seeds and ovules of all is very similar, and has been well described: in being exalbuminous they differ from those of any of the other groups of *Saxifrageæ*, as well as from *Droseraceæ*, amongst which they are most frequently placed in systematic works.

The placentation in all the species is decidedly parietal, as in *Droseraceæ*; nor have I, in the earliest-examined stages, detected any evidence of this being a deviation from the axile type: this has been held as an argument against allying *Parnassia* with *Hypericineæ*, but which the truly parietal placentation of *Elodea* invalidates; the loculicidal dehiscence of *Parnassia*, on the other hand, is against its Hypericineous alliance, as are its truly perigynous stamens and petals.

The remarkable staminodia of *Parnassia* demand some notice: these we regard as a whorl of stamina opposite the petals: in *P. tenella*, they appear under a very unusual form, much more nearly resembling stamina than those of the other species, being columnar, and terminated by a broad horizontal glandular disk; these, if not absolutely inserted in the same whorl with the stamens, are so nearly so, that in the fully-formed flower the bases of the filaments touch the bases of the staminodia on either side of them. The much-divided staminodia of *P. palustris*, and which have in part suggested the alliance of the genus with *Hypericineæ*, are much less usual than the simply lobed or trifid; and the staminodia are in some species almost entire, and so small as to escape notice; their nearest homologue in structure and position is perhaps to be found in the hypogynous scales of the allied Order *Crassulaceæ*.

The only other anomalies we have to indicate amongst the Indian kinds are, the foliaceous scape of *P. foliata*, a species otherwise nearly related to *P. palustris*, and which assumes a very different habit from any of its congeners, resembling *Saxifraga diversifolia*; and the decidedly creeping rhizome of *P. tenella*, whose fimbriated stipules, green flat flowers, reflexed petals, and curious staminodia, render it decidedly the most abnormal species of the genus hitherto discovered. It is somewhat singular, that though it deviates so remarkably from the typical forms, it does not throw any light upon the affinities of the genus.

#### PARNASSIA.

§ I. *Capsula* supera, ovoidea. *Staminodia* profunde divisa, segmentis filiformibus glanduloso-capitatis. *Placentæ* lineares secus totam longitudinem ovarii productæ.

1. *PARNASSIA FOLIOSA* (Hf. & T.). Caule acute quadrangulo angulis alatis folioso, foliis caulinis rotundato-cordatis sessilibus lobis amplexicaulibus, petalis profunde fimbriatis, stigmatibus subsessilibus.

*Hab.* Mont. Khasia regione temperata prope Moflong et Nonkreem, alt. 6000–7000 ped. ! rarissima. (fl. Sept.) (v. v.)

Herba pro genere robusta, glaberrima, spithamæa, structura floris *P. palustri* accedens. *Folia* radicalia non visa, caulina 6–8, alterna, coriacea, 1 unc. diametr., 5–7 nervia et costata. *Flores*  $\frac{1}{3}$ – $1\frac{1}{4}$  unc. diametr., albi.

2. *Parnassia palustris*, L. (Exempl. fructif.)

*Hab.* Tibetia occidentali regione temperata ad Iskardo, alt. 7000 ped. !

T. Thomson. (v. v.)

*Distr.* Europa, Asia et America boreali subalpina et subarctica.

§ II. *Capsula* supera, triquetra, late obcordata. *Staminodia* 5-7-fida.

3. *PARNASSIA WIGHTIANA* (Wall. Cat. 116). Foliis reniformibus, reniformi-rotundatisve, petalis plus minusve infra medium fimbriatis. — *Wight & Arn. Prodr.* 35; *Wight, Ill.* t. 21. B; *Ic.* t. 945; *Arnott in Hook. Comp. Bot. Mag.* ii. 315. *P. ornata*, Wall. Cat. 1247; *Arn. l. c.* *P. Schmidii*, Zenker, Plant. Ind. dec. 1. p. 3. t. 5.

*Hab.* Himalaya occidentali temperata. Kumaon! *Blinkworth.* Mont. Khasia, regione temperata, alt. 5000-6000 ped. frequens! *J. D. H. & T. T.* Mont. Nilgherrie, alt. 7000-8000 ped.! *Wight, &c.* (fl. Aug.) (v. v.)

Variat insigniter statura, foliis apice rotundatis acutisve; petalorum marginibus plus minusve fimbriatis apicibusque erosis integerrimisve; staminodiis 5-7-fidis, segmentis latis angustisve. *Placentæ* basin versus capsulæ.

§ III. *Capsula* supera, triquetra, late obcordata. *Staminodia* 3-loba v. trifida.

4. *PARNASSIA MYSORENSIS* (Heyne in Wall. Cat. 3754). Foliis radicalibus reniformibus v. rotundato-cordato-reniformibus sinu lato acutis rotundatisve, scapis (sæpissime numerosis) gracilibus, petalis obovato-spathulatis marginibus dentatis (rarius integerrimis), staminodiis elongato-cuneatis apice dilatatis trifidis, capsula subglobosa  $\frac{3}{4}$  supera, stylo attenuato brevi, stigmatibus 3-5. — *Wight & Arn. Prodr.* 35; *Arn. in Comp. Bot. Mag.* ii. 315.

β. Filicaulis, scapis filiformibus, foliis ovato-cordatis, petalis angustioribus.

*Hab.* Mont. Khasia regione temperata, alt. 5000-7000 ped. frequens! *Lobb, &c.* et Montibus Peninsulæ! *Heyne, &c.* (fl. Sept.) (v. v.)

Var. β. In sylvis temperatis Himalayæ orientalis prov. Sikkim, alt. 7000-9000 ped.! *J. D. H.* (fl. Aug.) (v. v.)

*Herba* 4-6-uncialis, plerumque multiflora. *Folia* sub  $\frac{1}{2}$  unc. lata. *Scapi* graciles v. subrobusti. *Flores*  $\frac{3}{4}$  unc. lati. *Petala* rarius integerrima.

§ IV. *Capsula* supera, triquetra, obcordata. *Placentæ* versus basin loculi. *Staminodia* simplicia, columnæformia, apice discifera.

5. *PARNASSIA TENELLA* (Hf. & T.). Rhizomate prostrato repente, stipulis fimbriatis, foliis reniformibus profunde bilobis marginibus eros, petalis spathulatis reflexis viridibus.

*Hab.* In sylvis temperatis Himalayæ orientalis ad Sikkim, alt. 9000-11,000 ped. inter muscos ad truncos arborum, &c. (fl. August.) (v. v.)

Species singularis, habitu ab omnibus diversa, sed indole florum similima. *Rhizoma* gracile,  $\frac{1}{2}$ -2 unc. longum, fibras plurimas emittens, apice folia pauca gerens. *Petioles* graciles, 1-1 $\frac{1}{2}$ -pollicares, basi stipulis

adnatis vaginantibus laceris membranaceis aucti. *Folia* late reniformia,  $\frac{3}{4}$ –1 unc. lata, glaberrima, læte viridia, margine tenuiter cartilagineo minute fisso et eroso. *Scapus* foliis duplo longior, tenuis, carnosulus, angulatus, infra florem 5-alatus, alis secus angulos calycis tubi productis. *Flores* virides, inclinati, plani,  $\frac{1}{4}$  unc. diametr. *Calycis* lobi breviter oblongi, obtusi. *Petala* paulo obliqua, margine interdum erosa, v. dentata, supra medium arcute reflexa apice rotundata. *Stamina* 5, filamenta subulata, basi dilatata. *Staminodia*  $\frac{1}{2}$  longit. staminum, erecta, crassa, teretia, apice discum scutiformem glandulosum viridem gerentia, stipitibus ima basi paulo dilatatis et una cum staminibus seriem unicum formantibus. *Ovarium* globosum, superum, disco plano insidens, stylo brevi; stigmata 3 divergentia apice truncata. *Capsula* immatura late obcordata stylo conspicuo, triquetra v. trilata, coriacea, indehiscens? *Semina* lineari-oblonga, testa brunnea coriacea, embryone generis.

§ V. *Capsula* semi-supera. *Staminodia* 3-loba v. trifida.

6. PARNASSIA NUBICOLA (*Wall. Cat.* 1246). Foliis radicalibus ovatis ovato-oblongis cordato-oblongisve, caulino oblongo petiolo brevissimo amplexicauli, petalis anguste spathulatis marginibus erosis v. infra medium fimbriatis, staminodiis superne late dilatatis trifidis, ovarii parte superiore conica, stigmatibus 3 sessilibus.—*Arn. in Comp. Bot. Mag.* ii. 315; *Wight, Ill.* t. 21. C.

*Hab.* In Himalayæ regione temperata, alt. 6000–12,000 ped., a Sikkim! *J. D. H.*, ad Kashmir! *T. Thomson*, frequens. (fl. Aug.) (v. v.)

*Herba* 4 unc. ad  $1\frac{1}{2}$  pedalem. *Capsula* inclinata semisupera; pars inferior  $\frac{1}{2}$ -pollicaris obconica, superior hemisphærica coriacea trivalvis valvis apice stylo brevi persistente terminatis, seminibus testa laxa.

7. PARNASSIA AFFINIS (*Hf. & T.*). Foliis radicalibus ovato-oblongis oblongo-cordatisve obtusis, scapo nudo v. basin versus 1-foliato, petalis obovato-spathulatis marginibus eroso-dentatis, staminodiis cuneato-quadratis obtuse trilobis v. trifidis, capsula semisupera stylo attenuato.

*Hab.* In Himalayæ orientalis regione temperata et alpina provinciæ Sikkim, alt. 11,000–14,000 ped. (fl. Jul.) (v. v.)

Inter *P. nubicolam* et *P. pusillam* media; a priore differt statura humiliore omnibus partibus minore, staminodiis brevioribus styloque longiore; a *P. pusilla* differt statura triplo majore, staminodiis longioribus quam latis. A *P. oblonga* differt staminodiis, a *P. Mysorensi* forma foliorum et capsulæ.

8. PARNASSIA PUSILLA (*Wall. Cat.* 1245). 1–3-pollicaris, foliis radicalibus reniformibus subtus discoloribus, caulino ovato-cordato amplexicauli, petalis late oblongis v. obovato-spathulatis marginibus infra medium parce fimbriatis, staminodiis latioribus quam longis obtuse 3-lobis.—*Arn. in Comp. Bot. Mag.* ii. 315.

*Hab.* Regione alpina Himalayæ, alt. 10,000–15,000 ped., a Sikkim !  
*J. D. H.*, ad Kunawur ! *Thomson.* (fl. Aug.) (v. v.)

Formæ perpusillæ *P. nubicolæ* simillima, sed forma petalorum et staminodiorum diversa. *Folia* 2–4 lin. lata. *Flores*  $\frac{1}{4}$ – $\frac{1}{2}$  unc. lati. *Capsula* ut in *P. nubicola*, sed brevior. *Petala* interdum emarginata.

9. *PARNASSIA OVATA* (*Ledeb. in Mem. Acad. Petersb.* v. p. 528). Foliis radicalibus ovalibus ovali-cordatisve obtusis, scapo gracili, petalis obovato- v. lineari-spathulatis integerrimis, staminodiis elongato-cuneatis trifidis segmentis subulatis erectis.—*P. subacaulis*, Kar. & Kiril.

*Hab.* In Himalaya occidentali et Tibetia occidentali temperata et alpina, alt. 8000–15,000 ped. Affghanistan ! *Griffith.* Kashmir ! *Jacquemont.* Kishtwar ! Parang ! Balti ! Gugi ! &c. frequens, *T. Thomson.* (fl. Sept.) (v. v.)

*Distr.* In Siberia trans-baikalensi et Soongaria.

*Herba* statura variabilis, 1–10-pollicaris. *Folia* parva,  $\frac{1}{2}$ – $1\frac{1}{2}$  poll. longa. *Scapi* plerumque graciles, sæpe aphylli. *Flores*  $\frac{1}{4}$ – $\frac{1}{2}$  unc. diametr. *Capsula* ut in *P. nubicola*, &c. sed multoties minor.

## Nat. Ord. DROSERACEÆ.

### Gen. I. DROSERA, *L.*

(Diagnoses ex Planchon in *Ann. Sc. Nat. sér. iii. vol. ix.*)

1. *DROSERA BURMANNI* (*Vahl, Symb.* iii. 50). Foliis omnibus radicalibus cuneato-spathulatis, stipulis scariosis, scapis 1–3, pedicellis glaberrimis, calyce 5-partito, stylis 5 indivisis, stigmatibus papilloso-fimbriatis, placentis 5.—*Planch. l. c.* p. 190; *Wight, Ill.* t. 20. A. (excl. fig. stigmatibus).

*Hab.* In Ceylonia ! *Macrae*, et Montibus Peninsulæ Nilghiri, *G. Thomson* ! Canara ! *Plant. Hohenack.* Bengalia ! *Wallich.* Himalaya orientali tropica ad Sikkim, alt. 1000 ped ! *J. D. H.* Silhet ! et Chittagong ! *J. D. H. & T. Thomson.* (fl. Nov.) (v. v.)

*Distr.* Africa occidentali ; China ; Ins. Philippinis ; Borneo ; Nov. Zealandia.

2. *DROSERA INDICA* (*Linn. Fl. Zeyl.* p. 51). Caule simpliciusculo decumbente, foliis sparsis linearibus acuminatis, racemis oppositifoliis 3-paucifloris, calycis laciniis anguste lanceolatis, stylis 3 bipartitis, placentis 3.—*Planch. l. c.* ; *Wight, Ill.* i. t. 20. f. C. (excl. fig. stigmatibus). Cf. *D. Finlaysoniana*, Wall. Cat. *D. Indica* var. ? fide *Planchon.*

*Hab.* In Ceylonia, *Macrae*, &c. Maisor ! et Canara ! *Wight*, &c. Tennasserim ad Tavoy ! *Gomez.* Pegu ! *M'Lelland.*

*Distr.* Africa occidentali ! Ins. Philippinis ! Australia !

3. *DROSERA LUNATA* (*Ham. ex D.C. Prodr.* i. 319). Glaberrima, foliis radicalibus fugacissimis, caulinis lunatis longe petiolatis, calycis



lobis subrhombeo-ovatis glaberrimis apice fimbriatis, stylis 3 fimbriato-laceris, capsula 3-valvi.—*Planch. l. c.* 296. *D. peltata*, Wight & Arn. Prodr. i. 34 (non Smith); Wight, Ill. t. 20. D.

*Hab.* In regionibus subtropicis temperatisque totius Indiæ. In Himalaya tota, alt. 5000–10,000 ped., a Kunawur! *T. Thomson*, ad Sikkim! *J. D. H.* Montibus Peninsulæ a Concan! *Stocks*, ad Nilghiri, *Wight*, &c. In Ceylonia! *Gardner*, &c., neonon Monte Kola in Peninsula Malayana prope Malacca, *Lobb.* (fl. Mai.–Octobr.) (v. v.)

*Distr.* China! Java!

## Gen. II. ALDROVANDA, *Monti.*

1. *Aldrovanda vesiculosa*, Linn. Sp. Pl. 412; *Planch. l. c.* *A. verticillata*, Roxb. Fl. Ind. ii. 113.

*Hab.* Bengaliam inferiorem; prope Calcutta! *Roxburgh*; paludibus “Salt-pans” dictis, *T. Thomson.* (fl. ?) (v. v.)

*Distr.* Gallia australi! Pedemontana! Rossia media, et Lithuania. Exemplaria Bengalensia cum Gallicis omnino conveniunt.

## Nat. Ord. PHILADELPHEÆ.

### Gen. I. PHILADELPHUS, *L.*

1. *Philadelphus coronarius*, *L.*

Var.  $\beta$ . *tomentosa*. *P. tomentosus*, Wall. Cat. 3653; Royle, Ill. 216. t. 46. f. 1.

*Hab.* In Himalaya occidentali temperata, alt. 7000–8000 ped. Garwhal! *Strachey & Winterbottom.* Simla! *Madden*, &c. Kishtwar! *T. Thomson.*

Var.  $\beta$ . In Himalaya temperata tota, a Sikkim, alt. 7000–9000 ped.! *J. D. H.*, ad Jamu, alt. 5000–6000 ped.! *T. Thomson.* (fl. Mai., Jun.) (v. v.)

*Distr.* Europa centrali? Japan!

### Gen. II. DEUTZIA.

1. *DEUTZIA CORYMBOSA* (*Brown in Wall. Cat.* 3652). Foliis ovatis acuminatis lanceolatisve serratis, ramulis corymbisque stellato-puberulis, floribus paniculatisve corymbosis, calycis segmentis triangulari-ovatis, petalis late obovatis rotundatisve glabris.—*Royle, Ill.* t. 46. f. 2; *Bot. Reg. N. S. xxv. Miscell.* p. 37. xxvi. t. 5.

*Hab.* In Himalaya temperata tota, a Bhotan! *Griffith*, et Sikkim, alt. 7000–12,000 ped.! *J. D. H.*; ad Kishtwar, alt. 6000–10,000 ped.! *T. Thomson.* (fl. Mai.–Jul.) (v. v.)

2. *DEUTZIA STAMINEA* (*Br. in Wall. Cat.* 3651, et in *Wall. Plant. As. Rar.* ii. 82. t. 191). Foliis ovato-lanceolatis ovatisve acuminatis serratis supra ramulis paniculisque scaberulis subtus calycibusque cine-

rascentibus, floribus ramulis lateralibus paniculatis, calycis segmentis ovatis apice subulatis, petalis lineari-obovatis oblongisve pubescentibus.—*Lindl. Bot. Reg.* xxxiii. t. 13. Cf. *D. scabra*, Thunb.

Var.  $\beta$ . *Brunoniana*, Wall., floribus majoribus.

*Hab.* In Himalaya temperata tota. Sikkim, alt. 7000–10,000 ped.!

*J. D. H.* Nipal! *Wallich*. Kumaon! 5000–8000 ped., *Blinkworth*, &c. Simla! *Comitissa Dalhousie*, &c. Kashmir! *T. Thomson*. Marri! *Fleming*. (fl. Mai.) (v. v.)

*Distr.* ? Japan.

3. *DEUTZIA MACRANTHA* (*Hf. & T.*). Foliis ovatis longe acuminatis irregulariter sinuato-denticulatis ramulisque stellatim puberulis, panicula terminali trichotoma pauciflora, calycis lobis subulatis, petalis elliptico-lanceolatis glabris.

*Hab.* In Himalaya occidentali temperata. Kumaon, alt. 5500 ped. ! *Strachey & Winterbottom*.

Habitus *Philadelphi*. Folia  $2\frac{1}{2}$ –3 unc. longa. Flores fere 1 unc. diametro.

#### Nat. Ord. HAMAMELIDEÆ.

(Conspectus Generum Floræ Indiæ Orientalis.)

1. *CORYLOPSIS*, *Sieb. & Zucc.* Calycis limbus semi-superus, valvatus. Petala 5, subvalvata, elongata. Stamina 5, squamulis alternantia. Ovarium 2-loculare; ovulis solitariis. Capsula lignea, endocarpio corneo soluto. Semina testa crustacea nitida.—Frutices; foliis stipulatis, serratis, deciduis; floribus præcocibus, amentaceis; amentis nutantibus.
2. *HAMAMELIS*, *L.* Calycis limbus semi-superus, valvatus. Petala 4, æstiv. involuto-valvata, linearia. Stamina 4, squamulis 4 alternantibus, filamentis brevibus, antheris valvula dehiscen-  
tibus. Ovarium 2-loculare; ovulis solitariis. Capsula lignosa, endocarpio corneo soluto. Semina testa crustacea nitida.—Frutices pube stellata; foliis stipulatis persistentibus; floribus capitatis.
3. *PARROTIA*, *C. A. Mey.* Calycis limbus semi-superus. Petala 0. Stamina 5–7. Ovarium 2-loculare, ovulis solitariis pendulis. Capsula coriaceo-lignosa, endocarpio corneo soluto. Semina testa crustacea.—Frutices v. arbores; foliis stipulatis, deciduis; floribus præcocibus, capitatis; capitulis involu-  
cratis.
4. *BUCKLANDIA*, *Br.* Flores polygamo-dioici, in capitula connati. Calycis limbus semi-superus, truncatus. Petala linearia, æstiv. involuta. Stamina 10–14. Ovarium 2-loculare, ovulis quovis

- loculo 6. *Fructus* multiplex, capsulis semi-exsertis bivalvibus demum liberis. *Semina* quovis loculo 6, infimo solum perfecto; testa coriacea superne in alam producta.—*Arbor elata, glaberrima*; foliis *persistentibus, primum stipulis 2 magnis coriaceis deciduis inclusis, vernat. inflexis*.
5. LIQUIDAMBAR, *L.* *Flores* capitati, connati, unisexuales. *Calycis* tubus basi ovario connatus, limbo lobato. *Petala* 0. *Stamina* plurima, filamentis brevibus. *Ovarium* 2-loculare; ovulis plurimis. *Fructus* multiplex; capsulis semi-exsertis bivalvibus demum liberis. *Semina* quovis loculo plurima, infimo solum perfecto; testa marginata.—*Arbores glabræ*; foliis *alternis deciduis? stipulatis*.
6. ANISOPHYLLEA, *Br.* *Flores* hermaphroditi, spicati. *Calyx* superus, 4-partitus, valvatus. *Petala* 4, laciniata, valvato-involuta. *Stamina* 8. *Ovarium* 4-loculare, ovulis solitariis pendulis. *Fructus* drupaceus, abortu 1-spermus.—*Arbores*; foliis *coriaceis, glaberrimis, 5-nerviis*; floribus *racemosis*.

Gen. I. CORYLOPSIS, *Sieb. & Zucc.*

1. CORYLOPSIS HIMALAYANA (*Griffith, Plant. Cantor, in Trans. As. Soc. Bengal*). Ramulis petiolis pedunculisque sericeo-tomentosis, foliis obovato-oblongis acutis acuminatisve argute serratis basi cordatis plicatis subtus cano-pubescentibus sericeisve, amentis pendulis, bracteis calycibusque dense sericeis, petalis linearibus albis, calyce fructifero subbaccato, seminibus nitidis.
- Hab.* In Himalaya orientali et Montibus Khasia regione temperata, alt. 5000–6000 ped., *Griffith, &c. (fl. Nov.) (v. v.)*

Gen. II. HAMAMELIS, *L.*

1. HAMAMELIS CHINENSIS (*Brown in Abel, Voy. 374. cum Icone*). Stellatim tomentosa, foliis ovato-oblongis acuminatis supra sparse puberulis, floribus subternis, calycis lobis ovatis obtusis, petalis anguste linearibus, capsulis obovatis dense tomentosis.
- Hab.* Montibus Khasia regione subtropica prope Nurtiung, alt. 4000–5000 ped., *J. D. H. & T. Thomson. (fl. Octobr.) (v. v.)*
- Distr.* China!

Gen. III. PARROTIA, *C. A. Mey.*

1. PARROTIA JACQUEMONTIANA (*Dcne in Plant. Jacq. 73. t. 83*). Foliis orbiculatis obovatisve basi cordatis grosse dentatis supra glabris opacis subtus petiolis pedunculis capsulisque dense stellatim tomentosis, stipulis ovatis oblongisve pubescentibus, involucris ob-

ovato-rotundatis membranaceis albis integerrimis lobatis serratisve.—  
*Fothergilla involucrata*, Falconer in Linn. Soc. Proceedings, Febr.  
 1839, et in Royle, Ill. Introd. xxv.

*Hab.* Himalaya occidentali temperata; Chamba! et Kashmir! alt. 5000–7000 ped., *T. Thomson.* (fl. Mart.) (v. v.)

#### Gen. IV. BUCKLANDIA, *Br.*

1. *Bucklandia populifolia*, *Br.* in Wall. Cat. 7414; Griffith in As. Research. xix. 94. t. 13, 14.

*Hab.* In Himalaya orientali temperata et subtropica, Nepal! et Sikkim!  
 alt. 4000–7000 ped.! *J. D. H.*, et in Montibus Khasia, alt. 4000–6000  
 ped.! *Griffith*, &c. (fl. Nov.) (v. v.)

#### Gen. V. LIQUIDAMBAR, *L.*

1. *Liquidambar Altingia*, Blume; Flor. Jav. fasc. xvii. p. 6. t. 1, 2.—  
*Sedgwickia cerasifolia*, Griffith in As. Research. xix. p. 98. t. 15, 16.

*Hab.* In Assam! et Montibus Mishmee! *Griffith.*

*Distr.* Java!

#### Gen. VI. ANISOPHYLLEA, *Br.*

1. *Anisophyllea Zeylanica*, Benth. in Niger Flora, 575 & 342.—*Tetra-  
 crypta cinnamomoides*, Gardn. & Champ. in Hook. Journ. Bot. i. 314.  
 et v. 378.

*Hab.* Insula Ceylon, regione tropica!, *Gardner*, &c.

### Nat. Ord. RIBESIACEÆ.

#### Gen. I. RIBES, *L.*

##### a. *Flores solitarii.*

1. *Ribes Grossularia*, Linn. Wall. Cat. 6835, et in Flor. Ind. ii. 514.—  
*R. Himalensis*, Royle, Ill. 225.—*R. alpestre*, Dene in Plant. Jacq. 64.  
 t. 75.

*Hab.* In Himalaya occidentali temperata. Kumaon, alt. 11,500 ped.!  
*Webb*, *Strachey* & *Winterbottom.* Kunawur, alt. 9000–12,000 ped.!  
*Jacquemont*, &c. Kashmir! *Falconer*, &c. (fl. Mai.)

*Distr.* Europa boreali et alpina, Græcia! Caucasus!

- b. *Flores racemosi.* *Calycis* tubus brevis, ultra ovarium non longe  
 productus.

2. *RIBES LEPTOSTACHYUM* (*Dcne in Voy. Jacq. Bot. 65. t. 76*; non  
*Benth. Plant. Hartweg*). Polygamo-dioicum, glanduloso-puberulum et  
 pilosiusculum, foliis parvis ( $\frac{1}{2}$ –1-pollicaribus) late rotundato-cordatis  
 reniformi-rotundatisve 3-lobis crenato-dentatis, racemis subdensifloris,  
 bracteis linearibus, floribus parvis viridibus, calycis tubo late obconico,

lobis ovato-rotundatis obtusis, baccis parvis glandulosis v. glabratiss.—*R. villosum*, Wall. Cat. 6832, et in Flor. Ind. ii. 514; Don, Gen. Syst. Gard. iii. 187.—Cf. *R. orientale*, Poir. et *R. heterotrichum*, C. A. Meyer in Led. Flor. Ross.

*Hab.* In Himalaya occidentali temperata. Nepal! *Wallich*, et Garwhal, alt. 10,000–11,000 ped.! *Strachey & Winterbottom*; Kashmir, alt. 7000–9000 ped.! *Jacquemont*, &c. In Tibetia occidentali, alt. 8000–14,000 ped. vulgatiss.! *T. Thomson*. Affghanistan! *Griffith*. (fl. Mai., Jun.) (v. v.)

*Distr.* ? Siberia. ? Persia. ? Soongaria.

*Bracteæ* pedicellos subæquantes. *Flores* fusci v. luride flavi. *Petala* late obovata, patentia. *Filamenta* brevia, antheris vix longiora. *Stylus* longe bifidus, stigmatibus magnis capitatis.

3. *RIBES LACINIATUM* (*Hf. & T.*). Polygamo-dioicum, foliis (1–1½ unc. longis) gracile petiolatis triangulari-ovato-cordatis trilobis lobis argute dentatis acuminatis subtus ramulisque glaberrimis supra sparse puberulis, racemis gracilibus laxifloris folio brevioribus sparse glanduloso-puberulis, bracteis linearibus acuminatis, floribus parvis, calycis tubo late obconico lobis lanceolatis acuminatis fusco-purpureis, antheris sessilibus, baccis glaberrimis parvis.

*Hab.* In Himalaya orientali temperata. Bhotan! *Griffith*. Sikkim, alt. 10,000–12,000 ped.! *J. D. H.* (fl. Jun.) (v. v.)

*R. glaciali* affine, differt præcipue foliis sublaciniatis, lobis angustioribus, calycisque lobis acuminatis. *Bracteæ* pedicellos graciles subæquantes. *Flores* glaberrimi. *Petala* linearia. *Stylus* longe bifidus, stigmatibus capitatis. *Baccæ* rubræ.

4. *RIBES LURIDUM* (*Hf. & T.*). Polygamo-dioicum, foliis ramulisque glaberrimis (1 unc. latis) late cordato-rotundatis trilobis lobis obtusis subduplicato-crenato-dentatis, racemis puberulis erectis folio brevioribus, floribus castaneis breve pedicellatis, bracteis oblongo-spathulatis, calycis tubo ovoidco lobis ovato-oblongis obtusiusculis, baccis glaberrimis.

*Hab.* In Himalaya orientali temperata. Sikkim, alt. 10,000–12,000 ped.! *J. D. H.* (fl. Jun.) (v. v.)

*R. glaciali* affine, differt foliis minoribus latioribus, lobis obtusis, floribus castaneis, bracteisque latioribus. *Frutex* 4-pedalis. *Rami* cortice nigro tecti. *Racemi* subdensiflori. *Flores* breve pedicellati. *Bracteolæ* pedicellos superantes. *Petala* late obovata, patula. *Antheræ* subsessiles. *Stylus* apice bifidus; stigmatibus capitatis.

5. *RIBES DESMOCARPUM* (*Hf. & T.*). Dioicum, ramulis petiolis racemisque dense glanduloso-pubescentibus, foliis (1½–2 poll. longis) ovato- v. triangulari-cordatis 3-lobis lobis acutis subduplicato-crenatis supra puberulis subtus glanduloso-pubescentibus, racemis multifloris, bracteis linearibus, calycis tubo late campanulato basi conico lobis ovato-oblongis obtusis, baccis glanduloso-pubescentibus.

*Hab.* In Himalaya orientali temperata. Bhotan! *Griffith.* Sikkim, alt. 10,000 ped.! *J. D. H.* (fl. Jun.) (v. v.)

*Rami* cortice fusco glabro, ramulis dense glandulosis. *Racemi* floriferi foliis subæquilongi. *Bracteolæ* pedicellos superantes. *Flores* fuscæ. *Petala* late obovato-spathulata. *Filamenta* antheris æquilonga. *Stylus* breviter bifidus, stigmatibus capitatis. *Baccæ* breve pedicellatæ subimbricatæ.

6. *RIBES GLACIALE* (*Wall. Cat.* 6833, et in *Flor. Ind.* ii. 513). Polygamo-dioicum, ramulis foliisque glaberrimis, foliis late triangulari-ovato-cordatis trilobis lobis acutis acuminatisve crenato-serratis, racemis floriferis erectis sparse puberulis, bracteis linearibus, floribus parvis, calycis tubo late obconico lobis oblongis acutiusculis patentibus, baccis parvis glaberrimis pubescentibusve.—*R. acuminatum*, *Wall. Cat.* 6834.

*Hab.* In Himalaya temperata, alt. 7000–10,000 ped. vulgaris et sæpissime epiphytica, a Bhotan! *Griffith*, ad Kashmir! (fl. Mai.) (v. v.)

*Folia* 1–2 unc. longa, interdum supra sparse pilosiuscula, plerumque longe petiolata. *Racemi* elongati. *Bracteæ* pedicellos superantes v. æquantes. *Flores* fuscæ (an semper?). *Petala* late obovata. *Filamenta* antheris duplo longiora. *Stylus* elongatus, breviter bifidus, stigmatibus capitatis. *Baccæ* rubræ.

c. *Flores* racemosi. *Calycis* tubus ultra ovarium longe productus.

7. *RIBES NIGRUM* (*L.*). Ramulis foliisque glaberrimis v. puberulis, foliis late ovato-cordatis 3–5-lobis lobis crenato-serratis, racemis breviusculis paucifloris, floribus (magnis) longe pedicellatis puberulis, bracteolis brevibus, calycis tubo late campanulato lobis reflexis obtusis, filamentis subulatis, baccis magnis glaberrimis.

*Hab.* In Himalaya et Tibetia occidentali temperata. Kunawur, alt. 8000–12,000 ped.! Kashmir! et Dras, alt. 7000–10,000 ped.! *T. Thomson.* (fl. Mai.) (v. v.)

*Distr.* Europa! et Siberia! usque ad Kamtchatka!

*Frutex* robustus glaberrimus. *Folia* 2–3 unc. longa. *Flores* virides. *Bracteolæ* pedicellis multoties breviores.—Variat hortis baccis nigris, violaceis, albis.

8. *RIBES GRIFFITHII* (*Hf. & T.*). Ramulis glabris, petiolis gracillimis basi ciliatis, foliis late ovato-rotundatis cordatis 3–7-lobis supra glaberrimis subtus secus nervos pubescentibus lobis argute serratis caudato-acuminatis, racemis longissimis pendulis laxifloris puberulis, bracteis elongatis linearibus oblongisve, floribus magnis, calycis tubo campanulato basi conico lobis lineari-oblongis obtusis reflexis, baccis magnis glaberrimis.

*Hab.* In Himalaya orientali temperata et subalpina. Bhotan! *Griffith.* Sikkim, alt. 10,000–13,000 ped.! *J. D. H.* (fl. Jun.) (v. v.)

*Species insignis.* *Petoli* 2–3 unc. longi. *Folia* 2–3 unc. lata, lobis

divaricatis in caudas productis, serraturis angustis, acutis. *Racemi* spithamæi! flexuosi. *Flores* dissiti, glaberrimi. *Bracteolæ* 2-3, pedicellos superantes, subulatæ. *Petala* obovato- v. oblongo-lineararia, unguiculata. *Stamina* erecta, filamentis elongatis. *Stylus* bifidus. *Buccæ* pulcherrimæ, ovoideæ, rubræ, acerbissimæ.

9. *RIBES RUBRUM* (L.). *Ramulis* glaberrimis, foliis longe petiolatis petiolis basi ciliatis ovato-cordatis 3-5-lobis utrinque glaberrimis lobis subacutis grosse crenato-dentatis, racemis elongatis pendulis flexuosis pubescentibus, bracteis minimis recurvis, calycis tubo campanulato basi conico lobis brevibus obtusis, baccis glaberrimis.—*R. Himalense*, Dcne in Plant. Jacq. 66. t. 67, non Royle.

*Hab.* In Himalaya occidentali temperata, alt. 6000-10,000 ped., frequens a Kumaon! *Thomson*, &c., ad Marri, *Fleming*! (fl. Mai., Jun.) (v. v.)

*Distr.* Europa! Caucasus! Siberia tota!

*Folia* 1-3 unc. longa, supra interdum sparse pilosiuscula. *Racemi* foliis æquilongi, laxiflori. *Bracteæ* pedicellis brevibus sæpius breviores. *Flores* magni, flavo-virides, glaberrimi, petalis obovato-spathulatis; staminibus erectis, filamentis elongatis; stylo simplici.

Quid *R. Takare*, Don, Prodr. 208 (indeterminabilis).

## Nat. Ord. CRASSULACEÆ.

### (Conspectus Generum Floræ Indiæ.)

1. *TILLÆA*, L. *Sepala* 3-5. *Petala* et *stamina* 3-5. *Squamulæ* hypogynæ 0. *Folliculi* 3-5, 2- v. polyspermi.—*Herbæ pusillæ*; foliis oppositis; floribus axillaribus, parvis.
2. *CRASSULA*, L. *Calyx* 5-partitus. *Petala*, *squamulæ* hypogynæ, et *stamina*, 5. *Folliculi* 5, oligo- v. polyspermi.—*Herbæ* v. frutices; foliis alternis oppositisve; floribus albis roseisve, sæpius paniculatis.
- †3. *BRYOPHYLLUM*, Salisb. *Calyx* inflatus, 4-fidus, valvatus. *Corolla* hypocrateriformis, limbo 4-lobo. *Stamina* 8, corollæ inserta. *Glandulæ* hypogynæ oblongæ. *Folliculi* 4, liberi, polyspermi.—*Suffrutices erecti, carnosi*; foliis oppositis, simplicibus v. imparipinnatis; cymis paniculatis.
4. *KALANCHOE*, Adans. *Calyx* 4-5-partitus. *Corolla* hypocrateriformis; limbo 4-5-fido. *Stamina* 8-10, corollæ inserta. *Glandulæ* hypogynæ lineares. *Folliculi* 4-5, polyspermi.—*Herbæ* basi frutescentes; ramis erectis; foliis oppositis, simplicibus pin-natisectisve; floribus cymoso-paniculatis.
5. *UMBILICUS*, D.C. *Calyx* 4-5-partitus. *Corolla* campanulata,

- 4-5-fida. *Stamina* 5-10, imæ corollæ inserta. *Squamulæ hypogynæ* obtusæ. *Folliculi* 5, polyspermi.—Herbæ; foliis *rosulatis alternisve simplicibus*; floribus *racemosis, rarius cymosis*.
6. SEMPERVIVUM, *L.* *Calyx* 6-20-partitus. *Petala* 6-20 libera v. basi connata. *Stamina* 12-40. *Squamulæ hypogynæ* apice truncatæ, dentatæ v. laceræ. *Folliculi* 6-20, polyspermi.—Herbæ, *rarius* suffrutices, *acaules v. caulescentes*; foliis *plerisque rosulatis*; floribus *cymosis, corymbosis, paniculatisve*.
7. SEDUM, *L.* *Sepala* 4-5. *Petala* 4-5. *Stamina* 8-10, perigyna, alterna petalis inserta. *Squamulæ hypogynæ* integræ v. apice emarginatæ, interdum minimæ v. 0. *Folliculi* 4-5, polyspermi.—Herbæ *erectæ v. diffusæ*; foliis *alternis rarius oppositis*; floribus *cymosis*.
8. TRIACTINA, *Hf. & T.* *Sepala* 5, minima. *Petala* 5. *Stamina* 10, perigyna, alterna petalis inserta. *Squamulæ hypogynæ* lineares. *Folliculi* 3, ad medium connati, polyspermi.—Herba *carnosula, subramosa*; foliis *alternis v. subverticillatis*; floribus *ramis cymæ laxè foliatæ sessilibus*.

Gen. I. TILLÆA, *L.*

1. *Tillæa pentandra*, Royle, Ill. 222 (nomen tantum); Edgew. in Linn. Trans. xx. 50.  
*Hab.* In Himalaya occidentali tropica, alt. 1000-6000 ped. Kumaon! Royle, &c. Simla! et Chamba! Thomson. Panjab, ad Peshawur! Vicary. Concan! Herb. Stocks. Mont. Nilghiri! Pl. Hohenacker. Maisor! Lobb. (fl. Sept.-Nov.) (v. v.)

Gen. II. CRASSULA, *L.*

1. CRASSULA INDICA (*Decne in Plant. Jacq.* 61. t. 73. f. 1). Glaberrima, foliis radicalibus rosulatis spathulatis, caulinis alternis, cymis paniculatis.—*Sedum paniculatum*, Wall. Cat. 7227.  
*Hab.* In Himalaya temperata, alt. 4000-8000 ped.! Bhotan! Griffith. Kumaon! Garwhal! Simla! Blinkworth, &c. Kunawur! Jacquemont. (fl. Aug.) (v. v.)

†Gen. III. BRYOPHYLLUM, *Salisb.*

- †1. *Bryophyllum calycinum*, Salisb. D.C. Prodr. iii. 396; Wall. Cat. 7205; Wight in Hook. Bot. Misc. iii. 100, Suppl. t. 1; Wight & Arn. Prodr. 360. *Cotyledon rhizophylla*, Roxb. Fl. Ind. ii. 456. *C. calycina*, Roth, nov. sp. 217.  
*Hab.* Locis calidis Bengalici, utriusque Peninsulæ Indiæ, frequens, ex Africa tropica? introducta. (fl. Dec.) (v. v.)



Gen. IV. KALANCHOE, *Adans.*

1. KALANCHOE VARIANS (*Haworth in Phil. Mag. N. S.* vol. ix. 1829, p. 302). Glaberrima, foliis glaucis crenatis obtusis inferioribus simplicibus ovatis supremis trifoliolatis, panicula subcorymbosa, sepalis lineari-ovatis lanceolatisve acuminatis, corollæ lobis acuminatis.—*Wall. Plant. As. Rar.* ii. 53. t. 167, sub nom. *K. subamplectens*, Cat. 7222.

*Hab.* In Himalaya tropica, alt. 1000–4000 ped. Simla! *Webb, Thomson.* Kumaon! *Wallich, Strachey & Winterbottom.* Nipal! *Wallich.* Sikim! *J. D. H.* Burmah! *Wallich.* (fl. Dec.) (v. v.)

2. KALANCHOE GRANDIFLORA (*Wall. Cat.* 7226). Glaberrima glauca, foliis obovatis, cymis laxè corymbosis, sepalis magnis ovatis oblongisve acutis, corollæ lobis ovalibus apice uncinatis.—*Wight & Arn. Prodr.* 359. *K. Wightiana*, *Wall. Cat.* 7225.—An var. *K. varians*?

*Hab.* Montibus Peninsulæ! regione tropica, *Wight, &c.* (fl. Dec.–Mai.)

3. KALANCHOE FLORIBUNDA (*Wight & Arn. Prodr.* 359). Superne glanduloso-pilosa, foliis superioribus alternis lanceolatis crenatis, cymis paniculatis rarius elongatis, floribus racemosis, sepalis subulatis, petalis oblongis mucronatis.—*K. spathulata*, *Wall. Cat.* 7224, non D.C.

*Hab.* In Himalaya tropica. Simla! Garwhal! *Thomson.* Bhotan! *Griffith.* Behar monte Parusnath, alt. 4000 ped.! *J. D. H.* Montibus Peninsulæ! regione tropica, *Wight, &c.* Ceylon! *Walker, &c.* (fl. Dec.–Mart.) (v. v.)

4. KALANCHOE LACINIATA (*D.C. Plantes Grasses*, t. 100). Foliis pinnatifido-laciniatis varie sectis lobis lineari-elongatis subserratis dentatisve, sepalis patulis lanceolatis acuminatis, cymis paniculatis.—*D.C. Prodr.* iii. 395; *Wall. Cat.* 7221; *Wight & Arn. Prodr.* 360. *Cotyledon laciniata* et *C. heterophylla*? *Roxb. Flor. Ind.* ii. 456.

*Hab.* Bengal ad Patna! *Hamilton.* Montibus Peninsulæ regione tropica! *Roxburgh, &c.* (fl. Dec.)

*Distr.* Java, Moluccas.

5. KALANCHOE TERETIFOLIA (*Haworth in Wall. Plant. As. Rar.* ii. 53. t. 166). Foliis triangularibus decompositis pedato-tripinnatisectis, petiolis dilatato-subamplectentibus, floribus (parvis) paniculato-corymbosis numerosissimis.—*Wall. Cat.* 7223.

*Hab.* Birmah, montibus Taong Dong, *Wallich.*

Quid *K. acutiflora*, *Haworth*, Syn. 109; *Andr. Bot. Rep.* 560.

Gen. V. UMBILICUS, *D.C.*

1. UMBILICUS OREADES (*Decne in Plant. Jacq.* 62, et *U. luteus in Ic.* 73. f. 2). Annua, glaberrima, caulibus cæspitosis basi ramosis ramis ascendentibus foliosis, foliis ( $\frac{1}{4}$  unc. longis) in ramis sterilibus rosulatis

lineari-lanceolatis oblongisve aristato-acuminatis, caulinis linearibus acuminatis teretiusculis, floribus ad apices ramorum 2-3 nutantibus, sepalis erectis oblongis acutis, petalis albis basi connatis ovato-lanceolatis acutis uninerviis paulo brevioribus, staminibus 5, glandulis hypogynis linearibus, carpellis turgidis stylo brevi setiformi.

*Hab.* In Himalaya occidentali et alpina. Kashmir ad Pyr-Panjal, *Jacquemont*. Kumaon, alt. 14,000 ped. ! *Strachey & Winterbottom*.

Herba carnosula, foliis *Sedo trullipetalo*, et floribus *Umbilico spathulato* subsimilis. *Rami* 2-4-unciales. *Flores* pro planta magni, albi, 4-5-meri. *Corolla* membranacea. *Stamina* corollæ æquilonga, basi petalorum marginibus sæpe adnata.

2. *UMBILICUS SPATHULATUS* (*Hf. & T.*). Glaberrimus, foliis ad apices propaginum rosulatis late petiolatis spathulatis acutis apiculatisve caulinis alternis lineari-oblongis, floribus subcorymbosis breve pedicellatis, sepalis 4-5 lineari-oblongis corollæ tubo duplo longioribus, corolla straminea profunde 4-5-fida lobis ovato-oblongis obtusis tubo ter longioribus, squamulis hypogynis linearibus apice dilatatis retusis, folliculis 5.

*Hab.* In Himalaya orientali temperata. Sikkim, alt. 10,000-12,000 ped. ! (fl. Aug.) (v. v.)

Annua? *Caulis* repens, ascendens, basi ramos decumbentes (propagines) emittens, 3-4-pollicaris, simplex v. ramosus, foliosus, crassitie pennæ corvinæ. *Flores* subfastigiati,  $\frac{1}{2}$  unc. longi, nutantes, demum erecti.—*Habitus et folia Sedum adenotrichum* referunt.

## Gen. VI. SEMPERVIVUM, L.

1. *SEMPERVIVUM ACUMINATUM* (*Dcne in Plant. Jacq. t. 74. f. 1*). Foliis radicalibus densissime rosulatis lineari-lanceolatis spathulatisve aristato-acuminatis glaberrimis, caulinis lineari-oblongis, floribus glabris, sepalis petalisque sub 8 subglandulosis, squamulis hypogynis lineari-oblongis obtusis.—*Sedum Moorcroftianum*, Wall. Cat. 7228, fid. Edgew. in Linn. Trans. xx. 49.

*Hab.* In Himalaya et Tibetia occidentali temperata et alpina. Garwhal ! et Gugi ! alt. 10,000-15,000 ped., *Strachey & Winterbottom*. Kunawur ! *Jacquemont*, &c. Piti ! *Thomson*. (fl. Aug.) (v. v.)

*Sepala* viridia, ovato-lanceolata, acuminata, corolla ter breviora. *Petala* sub 8, basi connata, ovato-lanceolata, acuminata, dorso alato carinata. *Folliculi* 8, subsetosi, membranacei, stylo filiformi ; semina sulcata.

2. *SEMPERVIVUM MUCRONATUM* (*Edgew. in Linn. Trans. xx. 49*). Foliis radicalibus densissime rosulatis lanceolatis aristato-acuminatis glaberrimis v. margine ciliatis, caulinis lanceolatis floribusque longe pedicellatis glanduloso-ciliatis, sepalis petalisque sub 8, squamulis hypogynis obovatis retusis rotundatis v. oblique truncatis.—An var. *S. acuminati*?

*Hab.* In Himalaya occidentali subalpina. Kumaon! et Garwhal! alt. 10,000–12,000 ped.! *Edgeworth, Strachey & Winterbottom.* (fl. Aug.)  
*Sepala* subulato-lanceolata, submembranacea, petalis triente breviora, dense glandulosa. *Petala* basi connata, lineari-lanceolata, aristata, carina dense glanduloso-pilosa. *Stamina* sub 16. *Folliculi* sub 6, stylo filiformi breviusculo.

3. *SEMPERVIVUM SEDOIDES* (*Dcne in Plant. Jacq. t. 74. f. 2*). Foliis radicalibus rosulatis lineari-oblongis obtusis tenuissime glanduloso-pilosis, caulinis lineari-obovatis, sepalis obovatis obtusis, petalis (sub 8) calycem staminaque superantibus ovatis lanceolatisve acutiusculis, ovariis attenuatis tenuissime glanduloso-pilosis.

*Hab.* Himalaya occidentali alpina. Kunawur et Kashmir, *Jacquemont.*

4. *SEMPERVIVUM ALBUM* (*Edgew. in Linn. Trans. xx. 49*). Foliis ciliatis radicalibus rosulatis obcuneatis carnosissimis, caulinis confertis imbricatis ovatis, sepalis pubescentibus petalis duplo brevioribus, petalis ovatis ciliatis albis.—An var. *S. sedoidis* foliis caulinis majoribus?

*Hab.* In Himalaya occidentali temperata. Kumaon, alt. 7000–8000 ped.! *Edgeworth.*

## Gen. VII. SEDUM, L.

The *Sedums* are most abundant in the alpine, subalpine, and temperate regions of the Himalaya; in the former they are a very conspicuous feature of the vegetation of rocky, stony, or otherwise very barren places, where those of the *Rhodiola* section especially form large rounded patches of a deep green colour in spring, becoming a bright or lurid red or purple in autumn; some of them attain 18,000 feet of elevation, which is almost the limit of vegetable life. Though a few species are found as low as 4000 feet in the Western Himalaya, and 6000 in the Eastern, not one has been found in the Khasia Mountains, or in any part of India south of the Himalaya. The genus *Saxifraga* is the only other Himalayan one containing a great number of species which offers at all a parallel case to this, only one of its species being found in the Khasia, and none elsewhere in India.

The following sketch of the Himalayan *Sedums* requires more indulgence than even the *Saxifrages*, from the extreme difficulty of limiting the species in a living state, and the still greater one of detecting the characters of the dried ones. We have found it difficult to indicate any one organ as affording good characters throughout large suites of species, or of specimens of a species. Nevertheless they all resolve themselves into very natural groups,

whose characters we have attempted to give. Of all the organs, the rhizome is one of the best-marked; in most of the species, in all indeed of the *Rhodiola* section, it is very large and elongate, sending out few lateral roots, and bearing usually numerous simple annual branches from the axils of membranous bracts towards its apex; these rhizomes root deep amongst the rocks, and are often divided from the very base into several ascending or erect trunks, each of which, bearing flowering stems, cause the individual plants of some species to attain a great size and rounded or hemispherical form. Young specimens of these large-rhizomed species are recognized with great difficulty: they have few prostrate or ascending stems with smaller leaves, and fewer comparatively larger flowers; and we find, that both in collecting and in sorting our specimens, we have invariably been led to regard the seedling and young specimens as very different species from the old. Such seedlings spring up by the banks of rills which have transported the seeds from greater elevations, and as the plants do not under these circumstances attain their proper development, their true origin may long remain unsuspected by the most careful and observing collector.

The *Rhodiola* section have, further, almost always robust branches, are perhaps invariably polygamous, and have rather turgid follicles with recurved apices. The leaves are variable in form and tothing, the outer and inner branches from near the apex of the same rhizome having often more or less different foliage. The cymes of inflorescence are naked or bracteate; in some species they are reduced to one or two flowers. The male flowers are often different-looking from the female, having narrower sepals and petals, which do not grow or dilate after flowering, as the sepals of the female plants sometimes do. The sepals are often unequal in size, most so in the male flower. The hypogynous glands do not afford very good characters, being variable in length and breadth, and in some species they are almost absent.

The remaining species are generally hermaphrodite, but not always so; they have usually more slender follicles with subulate or filiform erect styles.

The most alpine species are liable to excessive variation in stature, and size and colour of flower, from white to deep rose or red purple, and from orange to golden yellow. In most species the stamina are longer than the petals, and they generally preserve their proportionate length to a considerable degree; but frost-bitten specimens are often deceptive, and have sometimes

very irregularly-developed petals; the latter are variable in shape in all the species. The number of parts in each floral whorl varies from 4-5 in most species, and the stamens from 8-10. In all, the alternate stamens are inserted on the petals, never more than half-way from the base, but to a very variable degree in many species.

In *Sedum multicaule* the divaricating follicles appear slightly connected at the base (as they are in *S. pallidum*, M.B., and others), which has made us very reluctant to propose the new genus *Triactina* for one of the Eastern Himalayan species whose habit agrees in many respects with that of *S. multicaule*. But the consolidation of the carpels in *Triactina* is complete up to their middle; their number is constantly only 3, which, and its very minute calyx and whorled leaves, together seem to indicate the propriety of keeping it separate. It links the very different and non-crassulaceous-looking American genus *Penthorum* with *Sedum* in a very remarkable manner.

A. RHODIOLA. Flores dioici, v. polygami. Rhizoma suberectum, crassum, squamatum. Rami suberecti, validi, foliosi, simplices. Cymæ terminales.

a. Cymæ densifloræ, nudæ; ramis non aut vix bracteatis foliatisve.

1. SEDUM RHODIOLA (*D.C. Prodr.* iii. 401). Foliis sessilibus obovatis oblongisve serrato-dentatis, cyma congesta composita, floribus 4-5-meris breve pedicellatis flavidis, squamulis hypogynis late lineari-oblongis obtusis, stylo recurvo, stigmate discoideo.—*Led. Flor. Ross.* ii. 179.

*Hab.* In Himalaya et Tibetia occidentali subalpina et alpina; frequens, a Garwhal! ad Kashmir! alt. 12,000-17,000 ped., *Strachey & Winterbottom*, &c. (fl. Jul.) (v. v.)

*Distr.* Terris arcticis totis! et montibus Europæ! Asiæ! et Americæ borealis!

Variat insigniter statura, latitudine foliorum et magnitudine florum. Flores interdum gracile pedicellati. Calyx petalis brevior, interdum brevissimus. Petala lineari-lanceolata v. anguste linearia. Stamina petalis 2-3plo longioribus. Glandulæ hypogynæ interdum oblique trifidæ.

2. SEDUM HETERODONTUM (*Hf. & T.*). Ramis robustis, foliis sessilibus basi rotundatis cordatis v. auriculato-bilobis ovatis grosse irregulariter inciso-dentatis, cyma densissime congesta capitata, floribus 4-meris sessilibus roseis?, squamulis hypogynis ut in *S. Rhodiola*, stylo recurvo, stigmate parvo.—An forma *S. Rhodiola*?

Var. α. Foliis basi non aut vix cordatis profunde dentatis.

Var.  $\beta$ . Foliis basi auriculato-bilobis, minus dentatis.

*Hab.* In Himalaya occidentali temperata et alpina. Var.  $\alpha$ . Kunawur! Kishtwar! et Kashmir! alt. 8000–12,000 ped., *T. Thomson, Lance.*

Var.  $\beta$ . Kishtwar, alt. 12,000–14,000 ped.! *T. Thomson.* (fl. Aug.) (v. v.)

*Statura* elatior quam *S. Rhodiola*; folia multo latiora, grosse erosodentata; flores densius congesti sæpius in globum aggregati, juniores virides demum rosei? v. rarius flavi? *Sepala*, *stamina* et squamulæ hypogynæ variabiles.

3. *SEDUM CRENULATUM* (*Hf. & T.*). Ramis crassis, foliis subsessilibus imbricatis ovato- v. obovato-oblongis crenulatis, cymis sessilibus dense congestis foliis supremis involucrentis, floribus 4–5-meris, pedicellis longitudine calycis, sepalis anguste linearibus, glandulis hypogynis lineari-oblongis obtusis, stigmatibus discoideis.

*Hab.* In Himalaya alpina. Kumaon, 12,000 ped.! *Blinkworth, Strachey & Winterbottom.* Nepal? *Wallich.* Sikkim, alt. 14,000–18,000 ped. vulgatissimum! *J. D. H.*; et in Tibetia occidentali alpina, Gugi, 16,800 ped.! *Strachey & Winterbottom.* (fl. Aug.) (v. v.)

*Rhizoma* elongatum, crassitie pollicis et ultra. *Rami* numerosissimi, ascendentes, robusti, 3–5 poll. longi. *Folia*  $\frac{1}{3}$ – $\frac{1}{2}$  unc. longa. *Flores* 4–5-meri, rarius hermaphroditi. *Sepala* sæpe purpurea. *Petala* rosea, in exemplaribus e Kumaon flava?

b. *Cymæ* laxifloræ v. paucifloræ, ramulis non aut raro foliatis, interdum unifloris, v. floribus solitariis.

4. *SEDUM TIBETICUM* (*Hf. & T.*). Rhizomate ramis vetustioribus onusto, caulibus erectis graciliusculis, foliis ( $\frac{1}{3}$ – $\frac{1}{2}$ -pollicaribus) sessilibus crassis semiteretibus? lineari-oblongis acutis obtusive integerrimis obscure dentatis, cymorum ramis (fructu) distinctis, folliculis turgidis apice uncinato-recurvis.

*Hab.* In Himalaya et Tibetia occidentali alpina. Kunawur ad Werang! et Ladak! alt. 12,000–16,000 ped.! *T. Thomson.* Gugi! *Strachey & Winterbottom.* Affghanistan! *Griffith* (1684). (fl. Jun., Jul.) (v. v.)

*Rhizoma* crassitie pollicis. *Rami* interdum basi decumbentes v. ascendentes, crass. pennæ columbinæ. *Folia* subtus convexa. *Flores* rubri?

5. *SEDUM STRACHEYI* (*Hf. & T.*). Ramis gracilibus curvis, foliis parvis ( $\frac{1}{4}$ – $\frac{1}{3}$ -pollicaribus) sessilibus planis ovatis ovato-oblongisve obtusis crenatis subsinuatisve, cymis parvis, floribus pedicellatis, petalis calyce duplo longioribus, glandulis hypogynis lineari-oblongis emarginatis, folliculis subturgidis apice recurvis.

*Hab.* In Tibetia occidentali alpina. Piti! Parang! Nubra! &c., alt. 13,000–17,000 ped., *T. Thomson & H. Strachey* (fl. Jul.) (v. v.)

*S. crenulato* affine sed rhizomate ramisque gracilioribus, foliis floribusque minoribus.—*Rhizoma* crassitie pennæ anserinæ, squamis apicem versus  $\frac{1}{4}$  unc. latis. *Rami* 4-6 unc. longi. *Folia* pallide viridia. *Cymæ*  $\frac{1}{2}$ - $\frac{2}{3}$  unc. latæ, densifloræ. *Sepala* purpurea. *Petala* fl. ♂ alba v. rosea; fl. ♀ rosea v. purpurea. *Folliculi*  $\frac{1}{8}$ - $\frac{1}{4}$  unc. longi.

6. *SEDUM QUADRIFIDUM* (*Pallas, It. iii. App. 730. t. 6. f. 1*). Humile, rhizomate crassissimo, ramis brevibus ascendentibus erectisve, foliis confertis teretiusculis obtusis v. acutis ( $\frac{1}{8}$ - $\frac{1}{4}$  unc. longis), cyma 6-8-flora, floribus 4-5-meris breve pedicellatis, folliculis apice recurvis, glandulis hypogynis subquadratis retusis emarginatis truncatisve.

Var. *a.* Glaberrima, foliis obtusiusculis, cymis 6-8-floris.

Var. *β.* Glaberrima v. puberula, foliis acutiusculis marginibus sicco recurvis, ramis 1-2-floris.

Var. *γ.* *Scoparia*; rhizomate abbreviato crassissimo, ramis densissime confertis, foliis glaberrimis lineari-teretiusculis subacutis, floribus solitariis sessilibus.—An species distincta?

Var. *δ.* *Coccinea*; rhizomate crassissimo, ramis perplurimis foliisque patenti-recurvis subacutis acuminatisve glanduloso-puberulis marginibus sicco recurvis, cymis densifloris v. laxifloris.—*S. coccineum*, Royle, Ill. 223. t. 48.

Var. *ε.* *Acuminata*; puberula, rhizomate crassissimo, ramis perplurimis 2-pollicaribus gracilibus, foliis subulato-lanceolatis, acuminatis, marginibus planis.

*Hab.* In Tibetia et Himalaya alpina, alt. 13,000-18,000 ped. (fl. Jul., Aug.) (v. v.)

Var. *a.* Gugi, alt. 15,000 ped.! *Strachey & Winterbottom.* Kishtwar! et Zanskar! alt. 14,000-16,000 ped., *T. Thomson.*

Var. *β.* Kunawur! et Kishtwar! alt. 13,000-16,000 ped., *T. Thomson.*

Var. *γ.* Sikkim, alt. 16,000-18,000 ped.! *J. D. H.*

Var. *δ.* Kishtwar, 15,000-16,000 ped.! *Herb. Royle, T. Thomson.*

Var. *ε.* Kumaon! *Blinkworth*; Garwhal, alt. 10,500 ped.! *Strachey & Winterbottom.*

*Distr.* Rossia et Siberia arctica! Montibus Altai! Baikal et Dahuriæ!

Planta variabilis, cujus exemplaria juniora rhizomate nondum incrassato ramisque paucis ascendentibus ab vetustioribus primo intuitu diversissima apparent. *Flores* purpureæ, parvæ. *Stamina* plerumque petalis longiora, sed interdum (floribus vere gelatis?) abbreviatis.

c. *Cymæ* laxifloræ; ramis foliosis, v. floribus folio bracteatis.

7. *SEDUM HIMALENSE* (*Don, Prodr. 212*). Rhizomate crasso, ramis erectis ascendentibusve foliosis, foliis planis ( $\frac{1}{3}$ - $\frac{2}{3}$ -pollicaribus) obovato-v. oblongo-cuneatis lanceolatisve acutis acuminatisve apices versus dentatis, cymis evolutis foliosis, floribus pedicellatis ♂ planis, petalis lanceolatis sordide purpureis stamina subæquantibus, glandulis hypogynis atratis late triangularibus, folliculis turgidis apice recurvis.—

*D.C. Prodr. S. Himalayanum*, Wall. Cat., et *S. hypericifolium*, Wall. Cat.; in part. cf. *S. atropurpureum*, Turcz.

*Hab.* In Himalaya centrali et orientali alpina. Nipal! *Wallich.* Sikkim, alt. 13,000–17,000 ped.! *J. D. H.* (fl. Jul.) (v. v.)

*Rami* 6–14 unc. alti, folia superiora ramulique cymæ glaberrimi v. puberuli. *Flores* ♂  $\frac{1}{6}$ – $\frac{1}{4}$  unc. lati. *Sepala* subulata, petalis dimidio breviora. *Folliculi* atro-purpurei,  $\frac{1}{4}$  unc. longi.

8. *SEDUM BUPLEUROIDES* (*Wall. Cat.* 7229). Ramis graciliusculis elongatis, foliis polymorphis ( $\frac{2}{3}$ –2 pollicaribus) ovatis orbicularibus ovato-oblongisve acutis integerrimis basi rotundatis cordatis v. auriculato-bilobis, cyma effusa ramis divaricatis effusis foliosis, floribus ♂ planis sessilibus pedicellatisve, petalis lanceolatis atro-purpureis staminibus longioribus, glandulis hypogynis late cuneato-quadratis retusis lobatisve, folliculis turgidis apice uncinato-recurvis.

*Hab.* In Himalaya centrali et orientali subalpina et alpina. Nipal! *Wallich.* Sikkim, alt. 10,000–14,000 ped.! *J. D. H.* (fl. Jul. August.) (v. v.)

*Rhizoma* breve. *Caules* elongati, glaberrimi v. apices versus ramulique cymæ puberuli. *Cyma* laxa, dichotoma, ramosa, foliosa, 2–4 unc. diametro. *Glandulae* hypogynæ magnæ, atro-purpureæ.

9. *SEDUM ELONGATUM* (*Wall. Cat.* 7233). Rhizomate brevi crasso, ramis paucis elongatis, foliis (1–2 pollicaribus) sessilibus petiolatisve cuneato-oblongis obovatis lanceolatisve supra medium obtuse dentatis crenatisve, cymis effusis dichotomis ramosis, ramis divaricatis foliosis elongatis, floribus ♂ planis gracile pedicellatisve, petalis lanceolatis atro-purpureis staminibus brevioribus, glandulis hypogynis late cuneato-quadratis bilobis, folliculis turgidis apice subhamato-recurvis.

*Var. a.* Foliis petiolatis.

*Var. β.* Foliis lineari-oblongis basi lata subcordata sessilibus.—An species distincta?

*Hab.* In Himalaya temperata. Kumaon! *Blinkworth*; *Strachey & Winterbottom.* Nipal! *Wallich.* Sikkim, alt. 10,000–12,000 ped.! *J. D. H.* (fl. Jul.) (v. v.)

*Var. β.* Kumaon! *Blinkworth.*

*Rhizoma* breve. *Caules* 1, v. pauci elongati, pedales et ultra. *Folia* sicca pro genere submembranacea, latitudine varia, pallide viridia. *Cyma* late divaricatum ramosa.—*S. bupleuroidi* subsimilis, sed staminibus petalis longioribus.

10. *SEDUM FASTIGIATUM* (*Hf. & T.*). Rhizomate crasso, ramis plurimis erectis ascendentibusve, foliis patulis ( $\frac{1}{4}$ – $\frac{1}{2}$  pollicaribus) linearibus teretiusculis acutis obtusisve, cymis 3–8-floris simpliciusculis, ramulis brevibus, pedicellis foliatis, petalis suberectis linearibus stamina æquantibus, glandulis hypogynis in fl. ♀ quadratis, in fl. ♂ lineari-oblongis, folliculis turgidis apicibus brevibus recurvis.



*Hab.* Himalaya orientali alpina. Sikkim, alt. 14,000–17,000 ped. ! (fl. Aug.) (v. v.)

*S. quadrifido* affine sed majus, cymarum ramis pedicellisve florum 1-foliatis, et floribus folliculisque multo majoribus. *Rhizoma* crassitie digiti, perpendiculare. *Rami* plantæ ♂ graciles, 3-pollicares; in plant. ♀ robustiores, 4–5 pollicares. *Glandulæ* hypogynæ ut videtur valde variabiles, in fl. ♀ florentes longiores quam latæ sed post anthesin latiores quam longæ; in plant. ♂ semper longiores, apice truncatæ v. lobulatæ.

11. *SEDUM HUMILE* (*Hf. & T.*). Rhizomate pro planta crassissimo ramis vetustis dense scopario, ramis brevibus decumbentibus v. suberectis (pollicaribus), foliis linearibus lineari-oblongisve obtusis, floribus pro planta magnis ad apices ramorum solitariis v. 2–3 breve pedicellatis, 4–5-meris, sepalis ovatis subulatisve obtusis, petalis lanceolatis stamina subæquantibus, glandulis hypogynis late quadratis, folliculis turgidis, stylo recurvo.

*Hab.* In Himalaya orientali alpina. Sikkim, alt. 14,000–16,000 ped. ! *J. D. H.* (fl. August.) (v. v.).

Proxime affine *S. quadrifido* et *S. fastigiato*; a priore differt floribus majoribus, foliis latioribus, a *S. fastigiato* statura humili, sepalis latioribus, floribusque minoribus.

12. *SEDUM CORIACEUM* (*Wall. Cat. 7328*). Rhizomate crasso, cyma foliisque utrinque puberulis, foliis planis obovatis ( $\frac{1}{3}$  unc. longis), cyma paucifoliata.

*Hab.* Nipal! *Wallich.*

*S. Stracheyi* simile sed totum puberulum, foliis obovatis et cyma pauciflora.

B. *Flores* hermaphroditi, rarius imperfecti. *Folliculi* subpedicellati. *Styli* fere recti, graciles, non aut vix recurvi. *Rhizoma* crassum, elongatum, perpendiculare v. horizontale.

13. *SEDUM CRASSIPES* (*Wall. Cat. 7234*). Ramis numerosis spithamæis simplicibus suberectis graciliusculis, foliis patulis planis anguste linearibus remote dentatis, cyma densiflora foliis involucrata, pedicellis brevibus bracteatis, floribus majusculis pallidis, petalis lanceolato-spathulatis staminibus paulo brevioribus, glandulis hypogynis brevissimis subquadratis, folliculis lanceolatis, stylo filiformi-subulato.

*Hab.* In Himalaya subalpina et alpina. Garwhal, alt. 10–500 ped. ! *Strachey & Winterbottom.* Nipal! *Wallich.* Sikkim, alt. 12,000–16,000 ped. ! *J. D. H.* (fl. Jul.–Sept.) (v. v.)

Plantæ juniores humiles, rhizomate parvo, ramis decumbentibus 2–4 pollicaribus, foliis  $\frac{1}{4}$ – $\frac{1}{2}$  pollicaribus, integerrimis dentatisve; vetustiores rhizomate crassitie pollicis, ramis spithamæis et ultra. *Folia* suprema cymam superantia. *Petala* straminea. *Flores* interdum unisexuales.

14. *SEDUM LINEARIFOLIUM* (Royle, *Ill.* 222. t. 48). Rhizomate ramoso, ramis breviusculis glabris glanduloso-pubescentibusque, foliis ( $\frac{1}{3}$  pollicaribus) linearibus dentatis, floribus subsolitariis (magnis!) petalis patulis lanceolatis acuminatis stamina superantibus, glandulis hypogynis quadratis retusis, folliculis subturgidis, stylo gracili.  
*Hab.* In Himalaya occidentali temperata, Kumaon! Royle.  
*Rhizoma* crassitie digiti minoris. *Rami* pollicares et ultra. *Flores* 1-3, expansi  $\frac{1}{2}$ - $\frac{3}{4}$  unc. diametro! *Petala* rubra? *sepalis* viridibus vix duplo longiora.
15. *SEDUM PAUCIFLORUM* (Edgew. *Linn. Trans.* xx. 49). Rhizomate crassissimo, ramis gracilibus glaberrimis, foliis linearibus integerrimis v. apices versus paucidentatis, cymis 6-8-floris, floribus pedicellatis bracteatis, sepalis ovatis, petalis ovato-lanceolatis stamina superantibus, glandulis hypogynis parvis orbiculari-quadratis, folliculis subturgidis, stylo gracili. *S. mucronatum*, Edgew. *l. c.*  
*Hab.* Himalaya occidentali temperata. Kumaon, alt. 8000-10,000 ped.! Royle, Edgeworth, &c. (fl. Jul.)  
*S. linearifolio*, Royle, affine; differt præcipue cyma 6-8-flora rarius pauciflora, sepalis brevioribus ovatis. *Antheræ* mucronatæ et muticæ in eodem specimine (mucrone verisimiliter deciduo).
16. *SEDUM TRIFIDUM* (Wall. *Cat.* 7230). Rhizomate breviusculo crasso, ramis gracilibus, foliis 1-3 pollicaribus lineari-lanceolatis spatulatisve late petiolatis grosse serratis sinuato-pinnatifidis lobatisve lobis obtusis, cymis ramosis foliatis, floribus pedicellatis, sepalis subulato-lanceolatis, petalis lineari-lanceolatis stamina subæquantibus, glandulis hypogynis quadratis, folliculis stylo gracili. *S. sinuatum*, Royle, MSS. *Ill.* p. 222; Edgew. in *Linn. Trans.* xx. 47.  
*Hab.* In Himalaya temperata, alt. 6000-10,000 ped., rupibus et truncis arborum epiphytica; a Simla! Comta. Dalhousie, ad Sikkim! J.D.H. (fl. Aug.) (v. v.)  
*Planta* valde variabilis. *Rhizoma* sæpe deforme. *Rami* spithamæi ascendentes. *Folia* interdum late obovato-spathulata. *Flores* plerumque rosei, sæpius remoti, interdum foliis lobatis bracteati.
17. *SEDUM WALLICHIANUM* (Hook. *l. c.* *Plant.* t. 604). Rhizomate crasso elongato, ramis plurimis erectis, foliis sessilibus (pollicaribus) lineari-lanceolatis grosse serratis v. interrupte pinnatifidis supremis cymam superantibus, cymæ ramis breviusculis foliatis, petalis suberectis linearibus staminibus æquilongis, glandulis hypogynis cuneato-quadratis late truncatis, folliculis angustis rectis, stylo gracili suberecto. *S. asiaticum*, Wall. *Cat.* 7239, B. in part. non D.C.  
*Hab.* In Himalaya occidentali subalpina. Kumaon, alt. 10,000-12,000 ped.! Blinkworth; Strachey & Winterbottom, &c.  
*Glaberrimum*. *Rami* spithamæi, crassitie pennæ columbæ. *Folia* carnosula, acuta, infra medium integerrima v. serrata, interdum interrupte pinnatifida lobata v. dentata. *Cyma* planiuscula, sed non

densiflora, foliis supremis involucrata. *Flores* pedicellati v. sessiles. *Sepala* linearia, petalis  $\frac{1}{2}$  breviora.—*Habitus* *S. imbricati* sed floribus rubris. *S. trifido* simillimum, sed differt rhizomate elongato crasso, ramis vetustis persistentibus, foliis uniformibus floribusque dioicis polygamisve.

18. *SEDUM IMBRICATUM* (Hf. & T.).

*Hab.* Himalaya occidentali alpina. Kumaon, alt. 11,000 14,500 ped. ! *Strachey & Winterbottom*; *Edgeworth*. Kunawur et Tibetia occidentali ! *T. Thomson*. (fl. Jun. Jul.) (v. v.)

*Habitus* et squamæ rhizomatis *S. Rhodiolæ*, sed flores sæpius hermaphroditi et folliculi angusti pedicellati, stylo gracili recto. Ab *S. Wallichiano* et cæteris hujus sectionis differt squamis rhizomatis, staminibusque petala longe superantibus.

C. Annuæ v. perennes (rhizomate nullo). *Folia* imbricata v. rosulata. *Flores* hermaphroditi.

a. *Folia* rosulata, caulina alterna. *Folliculi* 5, erecti, stylo filiformi recto.

19. *SEDUM ROSULATUM* (*Edgew. in Linn. Trans.* xx. 48). Superne glanduloso-pilosum (var.  $\beta$ . glaberrima), ramis gracilibus ascendentibus, foliis glabris radicalibus rosulatis petiolatis obovato-spathulatis caulinis parvis sparsis, floribus corymboso-paniculatis pedicellatis, petalis obovato-lanceolatis albis obtusis stamina superantibus, glandulis hypogynis nullis v. minimis, folliculis turgidis membranaceis, stylo gracili filiformi. *S. pyriforme*, Royle, Herb.

Var.  $\beta$ . Glaberrima.

*Hab.* Himalaya occidentali temperata, alt. 5000-9000 ped. ! Kumaon ! *Edgeworth*. Simla ! Kunawur ! & Jamu ! *Thomson*. Var.  $\beta$ . Simla ! *Comta. Dalhousie*. Kumaon ! *Thomson*. (fl. Mai.-Jun.) (v. v.)

*Folia*  $\frac{1}{3}$ - $\frac{2}{3}$  poll. longa, apice rotundata obtusa v. apiculata. *Rami* graciles, 2-4 poll. longi. *Flores* albi. *Petala* calyce duplo longiora, apice obtusa, acuta v. oblique truncata. *Folliculi* albi.

20. *SEDUM ADENOTRICHUM* (*Wall. Cat.* 7231). Superne glanduloso-pilosum, ramis gracilibus, foliis glabris, radicalibus rosulatis carnosissimis late petiolatis spathulato-cuneatis acutis mucronatisve, caulinis paucis sessilibus, floribus cymoso-paniculatis pedicellatis, pedicellis calycibusque glanduloso-pilosis, petalis lanceolatis acuminatis stamina superantibus, glandulis hypogynis parvis, folliculis membranaceis, stylo gracili ; *Edgew. Linn. Trans.* xx. 48.

? Var.  $\beta$ . glaberrima.

*Hab.* Himalaya occidentali temperata, alt. 3000-8000 ped. ! Kumaon ! *Blinkworth*, &c. Kashmir ! & Jamu ! *Thomson*. Marri, *Fleming*. Var. ?  $\beta$ . Bhotan ! *Griffith* (fl. Jul. Aug.) (v. v.).

*S. rosulato* affine et habitu simillimum ; differt foliis minoribus cras-

sioribus angustioribus, petalisque acuminatis. *Folia*  $\frac{1}{3}$ — $\frac{1}{2}$  unc. longa, sicca tenuiter marginata. *Sepala* ovato-lanceolata, petalis dimidio breviora. *Glandulæ hypogynæ* oblongæ, emarginatæ.—*Habitus* et folia radicalia *Umbilici spathulati*.

21. *SEDUM TRULLIPETALUM* (Hf. & T.). Annum, glaberrimum, cæspitosum, caulibus sterilibus brevibus foliis parvis ( $\frac{1}{4}$ -pollicaribus), dense imbricatis ovato-oblongis aristato-acuminatis carnosissimis, floriferis erectis laxius foliatis apice corymboso-ramosis, cymis densifloris, petalis unguiculatis lamina ovato-lanceolata carinata staminibus æquilongis, glandulis hypogynis minimis oblongis retusis, folliculis in stylum gracilem angustatis.

*Hab.* In Himalaya alpina. Kumaon, alt. 14,000 ped.! *Strachey & Winterbottom*. Nipalia orientali et Sikkim, alt. 13,000–16,000 ped.! *J. D. H.* (fl. Jul.) (v. v.)

Species parvula habitu ramosa, foliis *Tillææ*, sicco fusco-rubra, floribus viridibus exemplaribus luxuriantibus numerosissimis; petalis trulliformibus unguiculatis crasse carinatis albo virescentibus (sicco flavescentibus) ab congeneribus Himalaicis valde diversa. *Rami* floriferi 2–5 unc. alti. *Petala* latitudine varia, interdum anguste linearia.

b. *Folia* opposita.

22. *SEDUM EWERSII* (*Led. Fl. Alt.* ii. 191; *Flor. Ross.* ii. 182, et *l.c.* *Flor. Ross.* t. 58). Radice crasso multicipite, ramis ascendentibus, foliis oppositis orbiculato-obovatis obtusis integerrimis sinuato-dentatisve supremis sæpius cordatis, cyma ramosa corymbosa multiflora. *S. Gerardianum*, Wall. Cat. 7235. *S. azureum*, Royle, Ill. 222. t. 48. f. 2. *S. rubrum*, Royle, l. c. 222; Edgew. in Linn. Trans. xx. 47.

*Hab.* In Himalaya occidentali temperata et alpina, alt. 12,000–17,000 ped., a Kumaon! *Strachey & Winterbottom*, ad Kashmir! *Thomson*, necnon in Tibetia occidentali alpina et temperata vulgaris, *Thomson*. (fl. Jun.–August.) (v. v.)

*Distr.* Sibiria alpina! et Soongaria!

c. *Folia* alterna. *Folliculi* 3–5, maturi divaricati, liberi v. una basi connati.

23. *SEDUM PALLIDUM* (*M. Bieb. Flor. Taur. Cauc.* i. 353 et iii. 314.) Annum, pollicare, foliis teretiusculis linearibus obtusis sessilibus patentibus, cyma glandulosa puberula, petalis lanceolatis acuminato-cuspidatis calyce 4-plo longioribus, folliculis maturis divaricatis.—*Led. Fl. Ross.* ii. 185.

*Hab.* Punjab prope Peshawur! *Vicary*.

*Distr.* Levant! Tauria! Caucasus! Persia!

24. *SEDUM MULTICAULE* (*Wall. Cat.* 7232). Glaberrimum, caulibus basi ramosis, ramis ascendentibus, foliis sparsis linearibus teretiusculis acuminatis, floribus in cymas divaricatas seriatis sessilibus, petalis

ovato-lanceolatis longe acuminatis stamina superantibus, glandulis hypogynis parvis truncatis, folliculis 4-5 maturis divaricatis, stylo brevi subulato.—Cfr. *S. Japonicum*, Sieb.?

*Hab.* Himalaya temperata, alt. 4000-8000 ped. rupibus madidis truncisque arborum epiphytica, prope Peshawur! *Vicary*; Kumaon! & Simla! *Thomson*! *Strachey & Winterbottom*, &c.; Sikkim, *J. D. H.* (fl. Sept.) (v. v.)

*Caules* 3-6-pollicares, subrobusti. *Folia*  $\frac{1}{3}$ - $\frac{2}{3}$  unc. longa, aristato-acuminata. *Sepala* petalis subæqualia, viridia, acuminata. *Petala* flava v. interdum rosea?

25. *SEDUM PERPUSILLUM* (*Hf. & T.*). Annuum? subcæspitosum, glaberrimum, caulibus ramosis ascendentibus, foliis parvis ( $\frac{1}{8}$  unc. longis) sessilibus linearibus (teretiusculis?) obtusis, floribus (pro planta magnis) terminalibus axillaribusque 4-5-meris, sepalis oblongis obtusis, petalis oblongis oblongo-lanceolatisve obtusiusculis staminibus æquilongis, glandulis hypogynis punctiformibus, folliculis turgidis post anthesin divaricatis oligospermis, stylo brevi subulato, seminibus muriculatis.

*Hab.* In Himalaya subalpina et alpina. Garwhal, alt. 15,000 ped.? *Strachey & Winterbottom*, Sikkim, alt. 12,000 ped.! *J. D. H.* (fl. Jul.) (v. v.)

*Caules*  $\frac{1}{2}$ -1 pollicares, graciliusculi. *Folia* sicca plerumque basi saccata. *Flores* pro planta magni, breves, pedicellati, erecti. *Sepala* petalis paulo breviora, viridia. *Petala* alba. *Folliculi* virides, discreti.

Quid *Rhodiola Asiatica*, *Don. Prodr.* 213, quæ certe non *Sedum Asiaticum*, *Wall. Cat.*, fid. descript. *Donii*?

### Gen. VIII. TRIACTINA, *Hf. & T.*

1. *Triactina verticillata* (*Hf. & T.*).

*Hab.* In Himalaya orientali temperata; Sikkim sylvis humidis, alt. 10,000-12,000 ped.! *J. D. H.* (fl. Jun.) (v. v.)

Planta singularis ob carpella 3 infra medium in capsulam 3-valvem connata, sed affinitate *Sedo multicauli* quam maxime affinis.—*Caules* suberecti, spithamæi et ultra, glaberrimi. *Folia* exemplaribus meis annua, caulina, pauca, verticillata v. alterna, petiolata obovata v. obcordata, integerrima, 1-1 $\frac{1}{2}$  unc. longa, sicco membranacea, apice sæpius oblique retusa. *Flores* axillis foliorum cymæ laxifloræ sessiles, flavi; sepalis brevissimis, petalis ovato-lanceolatis acuminatis stamina subæquantibus; glandulis hypogynis linearibus apice dilatatis; folliculis 3, ad medium connatis, post anthesin divaricatis; *styli* graciles.

On a Monstrous Development in *Habenaria chlorantha*. By the Rev. J. S. HENSLOW, F.L.S., Prof. Bot. in the University of Cambridge. (Tab. I. B.)

[Read June 16th, 1857.]

THE specimen was gathered at Gamlingay in Cambridgeshire on May 25, 1857. The monstrosity to be described was confined to a single (the lowest) flower of the spike, of which about half the flowers were expanded. An enlarged drawing of the flower accompanies the description (Plate I. B, fig. 1).

The anterior sepal is united with one of the lateral sepals. This gives a slight obliquity to the flower, especially shown at the base of the lip.

Instead of the usual two anther-lobes on the edges of a widely-expanded connective, there are four anther-lobes here developed. These are associated in pairs, and to all appearance belong to two stamens placed before the lateral petals, or, in other words, alternating with the anterior and lateral outer segments of the perianth. Admitting Mr. R. Brown's view of orchid structure, these stamens must belong to the inner whorl of three, of which the third, contiguous to the lip, is wholly suppressed. If the two anthers in the present specimen were confluent, and their anterior lobes suppressed, we should have the structure exhibited by *H. chlorantha*. But if the posterior lobes were suppressed, the result would offer the general aspect of *H. bifolia*; only the pollen masses in the anterior lobes in this specimen have not their caudiculæ terminated by retinacula. It should seem the development has not been complete; for there is a cavity just below the extremities of the caudiculæ, in which a mass of retinaculum has been formed, as though the supply for two had coalesced, and been cut off by a bursicula-like lobe which intervenes between them and the caudiculæ.

The lateral staminodia (*s'*.) are well formed, and extend a little behind the contiguous fertile stamens. There is also a projection (*s*.) resembling a staminodium between the fertile stamens. It is in connexion with the bursicula-like lobe; and the bases of the contiguous anther-lobes are brought down in front of it. It therefore seems to be a staminodium belonging to the same *outer* whorl as the usual two well-marked staminodia! These appearances, if here correctly explained, are suggestive; and I venture to put the following questions:—

1. May not the two anther-lobes (in this genus and others, as

A.

Careya arborea.

2.

A.

3.

B.

Barringtonia  
racemosa.

3.

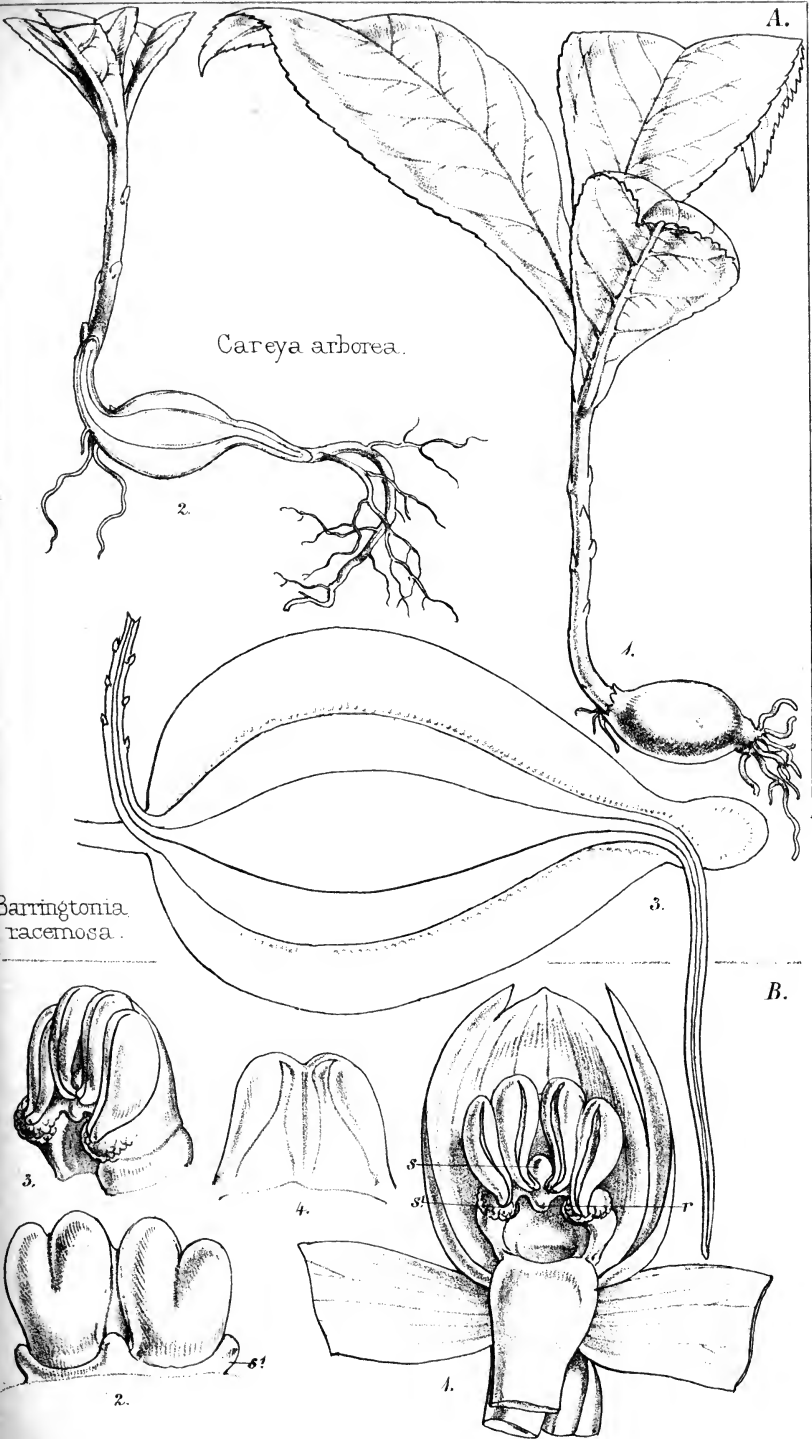
4.

1.

2.

6!

Habenaria (monstrosa) chlorantha & bifolia.

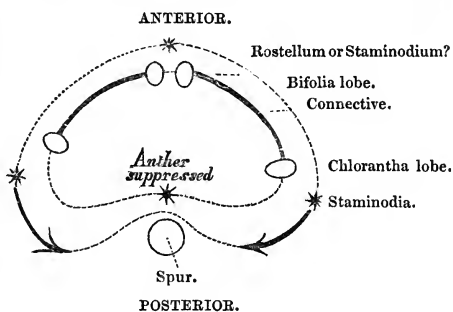


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*Orchis*, *Ophrys*, &c. allied to it), usually regarded as belonging to one, viz. the anterior, stamen of the *outer* whorl, belong rather to two stamens (viz. one to each of the two lateral) of the inner whorl, their other lobe in such cases being abortive? Such a structure would bring these genera into closer affinity with *Cypripedium*, where both lobes of the two lateral stamens of the inner whorl are fertile, whilst the anterior stamen of the outer whorl forms the prominent staminodium of that genus. If this should prove to be the case, the rostellum (where it occurs) would be the representative of the anterior stamen of the outer whorl, and not a process from the stigma, as it is usually regarded. In the present specimen, the lateral staminodia appear connected by a

continuous tissue, ranging outside the fertile stamens, with the rostellum-like process rising between them. The distortions or deviations from regularity which are in relation to the formation of lip and spur, seem here connected with the back-



ward extension of the connectives, dragging (as it were) one anther-lobe of the two lateral stamens, whether fertile or barren (*staminodia*), of both whorls towards the lip, whilst the other lobes (the anterior ones) have a tendency to become approximated to each other. Thus, the least obliterated of the anther-lobes (generally termed *staminodia*) belonging to the two lateral stamens of the outer whorl assume a position a little *behind* the contiguous lateral stamens of the inner whorl.

The entirely suppressed posterior stamens of the inner whorl may be regarded as merged into the spur of the lip. Possibly the entirely suppressed posterior anther-lobes of those outer stamens which produce the lateral *staminodia* are in the same condition. If we suppose a case in which the posterior stamen of the inner whorl were developed, we might *à priori* anticipate the lip would be replaced by a regularly-formed petal. If I remember rightly, a case of this sort has been recorded and figured in a monstrous variety of *Orchis latifolia*.

TAB. I. B. fig. 1, portion of flower; 2, back, and 3, front view of column; all magnified.

A short Exposition of the Structure of the Ovule and Seed-coats  
of *Magnolia*. By ASA GRAY, M.D., F.M.L.S., &c.

[Read November 19th, 1857.]

IN 1848, I maintained, in the 'Genera of North American Plants Illustrated,' vol. i., that the seeds of *Magnolia* were not arillate, but *baccate*, or in other words, that the fleshy coat was the testa. In 1855 this view was criticised by my excellent and most ingenious friend Mr. Miers before the Linnean Society (see Ann. and Mag. Nat. Hist. for May 1855); and he, upon speculative grounds rather than from immediate observations, concluded that "there is no reason to doubt that in *Magnolia* the scarlet envelope is due to a subsequent growth over the primine," and is therefore an arillus. As soon as Mr. Miers' remarks reached me, I re-examined the ovules and young seeds of the plants in question; and the results of new observations by Mr. Sprague and myself were published in Hooker's 'Journal of Botany,' vol. vii. p. 243 (1855), and vol. viii. p. 26. The points which I supposed we had settled by direct observation were:—

1st, That no accessory covering, or arillus, was developed over or upon the primine of the ovule; but

2nd, That the fleshy envelope of the seed represents the primine or outer coat of the ovule; and

3rd, That the bony coat of the seed was represented in the ovule only by the innermost layer of young cells, lining the primine; which cells, multiplying by merismatic division during the growth of the seed, and their walls at length thickening and hardening irregularly, form the crustaceous or bony coat; so that the character of the seed is best expressed by the term "drupaceous."

Drs. Hooker and Thomson, about the same time (*Flora Indica*, p. 73) also insist that the fleshy coat is the testa; and notice the delicate third coat, closely adherent to the albumen, but without offering any opinion respecting the nature or origin of this and the crustaceous coat\*.

\* Drs. Hooker and Thomson remark, that "the lateral position of the raphe with respect to the ovule and seed is worthy of note. It is well represented by Mr. Sprague in the plates of Asa Gray's work just quoted, but is not noticed in the text." If this refers to the pericarpic position of the raphes, that is only mentioned in the description of the ovules, although there is no need of it, as that position is the normal one (*vide* Gen. III. p. 10); if it refer to the position of the raphe on the middle of one of the broader sides of the seed, that is also noticed in the description of the seed.

I am not aware of any more recent direct investigation of the seeds of *Magnolia*. But in an elaborate memoir in the 'Transactions of the Linnean Society,' vol. xxii., Mr. Miers argues the question in detail, and reiterates his view formerly expressed, viz. "that the external fleshy envelope must be arilliform, the thick osseous nut must be the testa," &c.; that the raphe, or what he calls the "placentary sheath with its enclosed spiral vessels \* \* \* afterwards becomes expanded by almost imperceptible degrees over the primine, until it finally envelopes it \* \* \* and assumes the form of a distinct scarlet fleshy covering over the testa, being quite arilliform in its structure and appearance." And my excellent opponent goes on to state, that—"The only circumstance that bears any weight in the opposite view of the question, is one which certainly ought to have its due importance, and is one which I have never doubted in the smallest degree; viz. that Dr. Gray has watched the progress of the growth of the seed from the ovule, and could never detect any subsequent or extraneous production over the primine."

This "circumstance" does not appear to have had much weight, perhaps not so much as it was entitled to, considering that I had declared that very easy observation in the living plant sufficed to show that neither the fleshy nor the bony coat of the seed originated in the way Mr. Miers supposed, and had, moreover, asserted that I had arrived, from direct observations, at a different explanation of their nature and origin. Although not disposed to claim any particular authority for the observations made by Mr. Sprague and myself, even while they remain completely uncontradicted by any contrary observation, I may be allowed to express the opinion that a very simple and bare statement of what I said we saw, cannot properly be called an "argument," and still less, "ingenious reasoning." And I might equally object to having the candidly stated and unexpected discovery of the true origin of the bony coat (the only thing of any consequence which we have brought to light), described as an *ingenious substitution of an entirely new view of the subject*, if I were not well assured that my much-respected friend would, on reflection, at once disavow the implication.

My present object is simply to publish a selection from the sketches in which my observations (again repeated the present season) have been recorded by the accurate pencil of Mr. Sprague. They tell their own story, and are naturally entitled to more regard than my descriptive statement. I am indebted to the

Smithsonian Institution for leave to make the present use of the wood-cuts.

Fig. 1 represents a magnified vertical section of a pistil of *Magnolia umbrellata*, from a flower-bud about thirty days before anthesis; showing one of the forming ovules, the other being cut away. The ovule at this time is an apparently homogeneous cellular protuberance. Fig. 2 represents the ovule a week or two later in a similar side-view: the two coats now appear as rings or shallow and thickened cups around the base of the nucleus. Fig. 3 is another ovule, as it appeared a few days later. Fig. 4, another a few days later. Fig. 5, one from a



Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.



Fig. 5.



Fig. 6.



Fig. 7.

nearly full-grown flower-bud. Fig. 6, one from a just-opened blossom. Fig. 7, a vertical section of the same through the middle of the raphe. Fig. 8, a transverse section of the same. In both these sections the conspicuous cord of vessels of the raphe is shown to occupy a position about midway between the outer and inner surface of the primine, or external coat; and this continues to be its position throughout the growth of the seed.



Fig. 8.

Fig. 9 is an outline section of a full-grown ovule, like fig. 7, but on a larger scale, so that the parts may be lettered and compared with the figures beneath: *a*, is the primine or outer coat; *b*, the inner coat; *c*, the nucleus. Fig. 10 represents a slice of the tissue from the left-hand side of fig. 9, through the raphe and primine combined, the inner coat and a little of the nucleus; and fig. 11, a corresponding

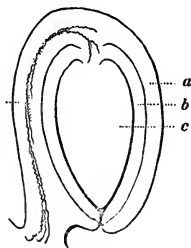


Fig. 9.

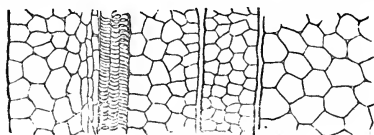


Fig. 10.

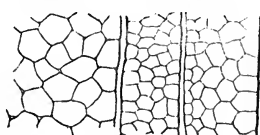


Fig. 11.

slice from the right-hand side,—the parts lettered as in fig. 9, viz. *a*, the outer coat; *b*, the inner coat; *c*, a portion of the tissue of

the nucleus of an unimpregnated ovule. The cells forming the inner lining of the primine at this time hardly differ from the rest except in their smaller size. Fig. 12 represents an impregnated ovule, or forming seed, of about a line and a half in length; its natural size is indicated by the perpendicular line at the right of the figure. The raphe, turned towards the eye, appears more prominent than in nature, except when the body is a little withered; it is then as conspicuous as is represented.



Fig. 12.

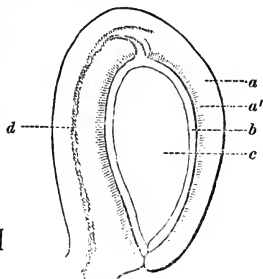


Fig. 13.

Fig. 13 is a magnified vertical section of the same, answering to that of fig. 9: *a*, the primine, or outer seed-coat; *a'*, its inner lining assuming a different texture and appearance; *b*, the secundine or inner coat, already beginning to adhere slightly to the nucleus *c*. On the other side, *d* is the cord of vessels of the raphe. A slice of the tissue through *d*, and extending into the nucleus, sufficiently magnified to reveal the structure, is shown in fig. 14, the parts of which are correspondingly lettered. The

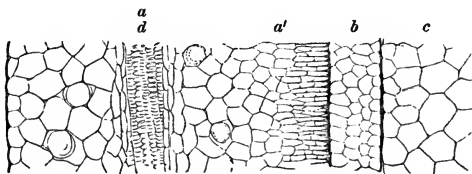


Fig. 14.

cord of spiral vessels, with some forming pleurenchyma, is still found in about the middle of what becomes the fleshy coat of the seed, while a stratum of narrow horizontal cells (*a'*) are developing on its inner face.

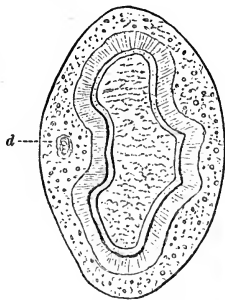


Fig. 16.



Fig. 15.

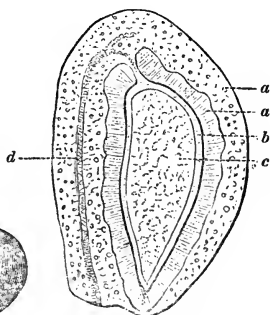


Fig. 17.

Our next stage exhibits the seed almost full-grown, and of the

size represented in fig. 15. This is taken early in July, about three weeks before the cones begin to assume a rosy hue, and while the crustaceous coat of the seed, although well developed, is only of a firm fleshy texture, or just commencing to harden at the chalaza. The tissue of the fleshy coat is by this time well filled with scattered oil-receptacles. The raphe, visible externally when the seed is a little withered, when fresh is hardly more to be discerned than in a *Pæonia*. Fig. 16 is an enlarged cross-section of fig. 15; *d*, the cord of vessels of the raphe. Fig. 17, a longitudinal section; *a*, the fleshy outer coat; *a'*, the forming bony coat; *b*, the delicate inner coat, answering to the secundine of the ovule; *c*, the nucleus; *d*, the cord of vessels of the raphe. Fig. 18 is a sec-

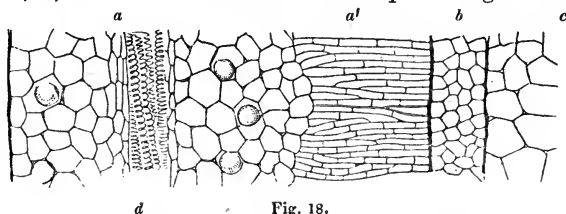


Fig. 18.

tion of the tissue of fig. 17, and answering to fig. 14; the parts correspondingly lettered. The only difference is that the about-to-be bony portion of the testa is more definite and has much increased in thickness. In ripening, this soon hardens, and at length its outer fleshy part turns red.

If these illustrations do not make the matter clear, the objector has only to examine the young seeds and ovules of *Magnolia* for himself. Although I do not perhaps completely understand how Mr. Miers arrived at the conclusions which he still maintains, I suspect it comes from his forming a wrong idea of the nature of the raphe, and from mistaking for the raphe in *Magnolia* the cord of vessels it contains. And I would ask him to make a comparative examination of the ovules and seeds of *Pæonia*; which, like many other anatropous seeds, at or before maturity, show no appearance of the raphe externally; in which the cord of vessels will be found more internal than in *Magnolia*, and yet where the fleshy surface of the seed will surely not be taken for an arillus, while the homologue of the latter is plainly visible at the base of the seed of most species. These seeds will also furnish convincing evidence that two, or even three, strata of very different texture may be developed from the primine or outer coat of the ovule.

Notes of a Botanical Ramble in the North of Spain. By JOSEPH WOOD, Esq., F.L.S. In a Letter addressed to R. KIPPIST, Esq., Libr.L.S.

[Read November 19th, 1857.]

My dear Kippist,—I promised to give you some account of my botanizing in Spain, but I have done so little that I am afraid you will think it hardly deserving a reading at the Linnean Society. As we grow old, little obstacles, which we should at once have overruled in our youth, become serious hindrances; and some slight attacks of disease, my ignorance of the language, and still more, the impossibility in most cases of having a bedroom to myself, combined to limit my exertions.

We went by rail to Bayonne, and hastened our journey in order to proceed by a steam-packet which professes to pass weekly from Bayonne to Santander, and which was to leave the former place on Tuesday the 5th of May. On our arrival we found that it certainly would not start before Thursday. We therefore availed ourselves of a diligence just then on the point of setting off for Bilbao, where we were taught to expect another steamboat for Santander. We were again disappointed. The boat had been detained at Santander for some repairs. There is a diligence from Bilbao to that place, but as it is twenty-six hours on the road, while the steamer occupies only six, it seemed worth while to wait a little. We did not get away till Sunday the 10th of May, and arrived at Santander in the middle of a violent storm. Our return to Bayonne was hardly more fortunate, since a hole in the boiler obliged us to stop at Passages. We may hope that all these uncertainties will be remedied as the railway to Madrid advances, and the port of Santander becomes of more importance.

The country about Bilbao consists of woody or heathy hills in a somewhat loamy soil, belonging, it is said, to the lower chalk or upper greensand,—a formation which extends over a large portion of France and all along the north of Spain. We had a pleasant walk at Bilbao, but not very rich in botany. *Lithospermum prostratum* exhibits frequently on the banks its bright blue flowers; *Erica polytrichifolia* occurs here and there, and *E. vagans* almost everywhere. Its flowers had not yet made their appearance, whilst those of *E. polytrichifolia* were already dried up. *Dabæcia polifolia*, *Smilax aspera*, *Asphodelus albus*, *Quercus Ilex*, *Euphorbia procera*, and one or two plants of *Cistus salvifolius*, make up the

list of those worth notice, but the weather was adverse to our researches.

The neighbourhood of Santander at first disappointed me, perhaps rather because there was not what I expected in the character of the vegetation, than from any absolute paucity of species. The hedges and general appearance of the country seemed very much like what we may see in England. A further examination, however, in a great degree corrected that impression. In the hedges we find *Laurus nobilis* and *Phillyrea media*, the latter very abundantly; and the banks are almost everywhere covered with *Scrophularia Scorodonia*, while *Smilax aspera* scrambles over the bushes. On the flowering branches the leaves have narrow divisions, while in those more distant from the flowers, the lobes assume the rounded form usually attributed to *S. mauritanica*. There are many rough bits of ground by road-sides, and some open spaces which might be called heaths. The largest of these seems doomed to perpetual barrenness from the custom of paring off the turf and carrying it away for fuel. In the others we meet with the *Dabæcia* and the *Lithospermum* already mentioned, and with *Erica vagans* and *Euphorbia verrucosa*. *Euphorbia procera* and *E. stricta* are also common about Santander: *Euphorbia platyphylla* is less plentiful. On these heaths are many spots of springy ground, adorned with several of our own more common bog plants,—*Hypericum Elodes*, *Anagallis tenella*, *Narthecium ossifragum*, &c., but no *Drosera*, and no *Pinguicula*. *Cyperus longus* is common. *Carex punctata* occurs in one or two places, and *Asphodelus albus* seems to prefer these moist situations. I found a *Carex* near my own residence at Fuente del Mar, which I at first put down as *C. genuensis*, but after a careful examination of different authors, I am inclined to consider *C. genuensis* as a non-entity, or at any rate a plant which it is impossible to identify. The one in question is probably a form of *C. glauca*, from which it differs in its larger size, the rounder and less pointed glumes of the fertile spikes, and by the rougher fruit. The spikes are erect, the fertile ones somewhat compound, the barren ones three or four in number, but these circumstances are occasionally found in *C. glauca*. Other plants not very common in England are, *Scilla verna*, *Vicia bithynica*, and *Lathyrus Nissolia*; and there are two or three plants not rare with us, which nevertheless may deserve notice. *Anthyllis vulneraria* is very common, but invariably with purple flowers. *Daucus Carota* abounds in all the meadows; it is white-rooted, and I think the same as our English species,



though much larger and more luxuriant than when growing on the chalky downs about Lewes. *Linum angustifolium* is so abundant as to form in many pastures a considerable portion of the herbage. Two rarer plants, *Melilotus messanensis* and *M. parviflorus*, grow by the side of the embryo railway.

Almost everywhere about Santander we find a *Raphanus*, which I believe to be the *R. Landra* of the South of Europe. At the beginning of May the pods had uniformly one cell and one seed; as the season advanced the number of joints increased, and before I came away I found one or two pods with six joints. At that time the plant seemed to have attained its full development, and the more perfect pods (for there were still many of one or two joints) seemed originally to be furnished with five or six ovules, one or two of which were frequently abortive, leaving isthmuses in the pods. In all this it approaches to *R. maritimus*, and no satisfactory distinction has been pointed out between them.

These notes relate to my first arrival at Santander. A few days afterwards *Serapias cordigera* began to show its dark purple flowers in the meadows, frequently growing in company with *Orchis latifolia*. *Serapias Lingua* appears a little later. This is chiefly distinguished by the gland at the base of the label, which in *S. cordigera* is divided by a deep furrow through its whole length. In *S. Lingua* it is so divided only at its base, while the extremity is rounded and entire, or only marked by a slight dimple. Unfortunately these glands shrink almost to nothing in drying, and no distinct character can then be observed in them. Nevertheless the plants are still readily known by the smaller and fewer flowers of *S. Lingua*, by the smaller label and narrow form of its middle lobe. *S. oxyglottis* of Bertoloni is a mere synonym of *S. Lingua*, and its admission into the 'Tourist's Flora' was an error. *S. longipetala* is separated from *S. cordigera* not only by its narrower label, but by the flowers disposed in a lengthened spike, while in *S. cordigera* they are always approximated at the top of the scape. Amidst the great abundance of *S. cordigera* I was in hopes of finding the *S. triloba* of Viviani, but I looked in vain. A comparison of specimens satisfies me that the plant of Lloyd (Flore de la Loire inférieure) is the same as that of the Genoese botanist, and this, according to Godron, is a hybrid between *S. cordigera* and *Orchis laxiflora*. I did not see the latter species in Spain.

Towards the end of May *Oxalis corniculata* makes its appearance, and another *Oxalis*, which covers the ground under the

Indian corn and the larger vegetables. It is stemless, with an umbel of lilac flowers, and an anther-like double gland at the extremity of each sepal. The bulb is exceedingly compound, throwing off as the plant advances a great number of bulbels, and as it propagates itself also by seed, it is become a great pest in all the cultivated land. It is a recent addition to the Spanish flora, and is believed to have been introduced among some hay imported from South America for the use of the British legion.

Another plant of doubtful history which I must not omit to mention is a *Lathyrus* having much the appearance of the common sweet-pea, but with rather smaller flowers and a standard of deeper purple. The pod is however very different, quite smooth, much longer than that of *L. odoratus*, and with a greater number of contiguous, sessile seeds, which are somewhat mottled when ripe. It is, I believe, perennial, though where I saw it, it was growing abundantly in the midst of a bed of sweet-peas in Mr. Sewell's garden. It appears that Mr. Sewell's gardener had gathered seeds of *Lathyrus sylvestris*, which grows just outside the gate of the premises, and had mixed them with sweet-pea seeds, and he believes that the plant in question is a hybrid between *L. odoratus* and *L. sylvestris*. This seems very improbable; because the plant in question is earlier in flowering than either of its supposed parents, and because it forms a fuller pod than either of them, and with apparently perfect seeds.

Among the later plants which are found in the immediate neighbourhood of Santander, I will mention *Inula crithmoides*, *Lavatera cretica*, which takes the place of our *Malva sylvestris*, *Lepidium Draba*, *Linum gallicum*, *Linum strictum*, *Lobelia urens*, *Lotus hispidus*, *Lythrum Preslii*, *Malva parviflora*, *Polycarpon tetraphyllum*, *Scirpus Savii* (there is no *Scirpus setaceus*), *Scirpus nigricans*, *Scorzonera humilis*, *Silene nutans*, and *Viola lactea* of Smith. *Lythrum Preslii* was first noticed by Gussone, but is not admitted as a species in the 'Flora Italica' of Bertoloni, that writer considering it as a variety of *L. Graefferi*. It is however a much handsomer plant. The flowers are a great deal larger, while the teeth of the calyx are smaller and less unequal. Gussone describes the plant as suberect and the stem as winged, neither of which I found to be correct, though the stem has occasionally the appearance of a wing on one angle; a circumstance which occurs sometimes also in *L. Graefferi*. The leaves are somewhat cordate at the base, but *foliis oblongis, basi subcordatis* would be a more exact description than *foliis cordato-oblongis*. We find

also a *Linaria*, which I am inclined to think the *L. Prestrandriae* of DeCandolle, whether this be a good species or not; its flowers resemble those of *L. spuria* rather than of *L. Elatine*; but many of the leaves are hastate, or more often with large teeth at the base. I have found in England and elsewhere, a plant which, having nearly the flowers of *L. spuria*, had some of the leaves hastate, as in *L. Elatine*, and I have thought it might be a hybrid between them, but the teeth at the base struck me as something I had not observed before. I did not notice at Santander either *L. spuria* or *L. Elatine*: this plant seems to take the place of both. I have never seen the intermediate plant in Sussex, where both species are abundant, and often growing together.

There are two walks near Santander very beautiful in themselves and very interesting to the botanist. The first is to a rock called Peña di Castillo, or the Rock of Castillo. This is a rugged hill above 600 feet high, about a mile from the town, and itself nearly a mile long, but very narrow, so that you walk along the ridge with a rocky precipice on the one hand and a steep slope on the other. It rises abruptly from the general level, and is unconnected with anything else about it. It is, I believe, of mountain limestone, which is said in this part of Spain to abound in calamine: I am told that there are also two other limestone formations, one belonging to the lower chalk or greensand, and the other to the Jura limestone, but I cannot say that I learnt to distinguish them. This Peña di Castillo affords the most beautiful views over the bay of Santander and its surrounding mountains on the one side, while on the other the eye wanders over the nearer hills to the open Bay of Biscay. To the west, or rather I believe to the south-west, we distinguish three groups of mountains, which in May were entirely covered with snow. At the beginning of July, when I left Santander, two of these groups offered only detached spots and lines of snow. The third, the Sierras Albas, still exhibited it in great masses. All these masses are visible from Fuente del Mar, the house which was my very pleasant home. On this rock I first noticed *Genista hispanica*, *Erinus alpinus*, *Linaria origanifolia*, and *Teucrium pyrenaicum*, all of which I observed in various places afterwards. *Orchis parviflora* grows in tolerable plenty on the slope of the north side; but I was surprised to see on such a rock several moisture-loving plants, as *Valeriana dioica*, *Lathyrus palustris*, &c. There is also a small quantity of *Anemone Hepatica* and *Saxifraga Geum*. The ridge of the rock affords, however, the best harvest. Here were *Centranthus Calcitrapa* and *Conyza*

*saxatilis* in abundance, *Osyris alba*, *Ruta bracteosa* (the three latter I found only in this place), *Euphorbia portlandica*, and *Stachys recta*. *Campanula Erinus* was abundant in one spot. There was also a large yellow *Orobanche*, which however I suspect to be only a variety of *O. major*. An abundant shrubby vegetation on a rocky soil prevented me from ascertaining on what plant it was growing. I noticed afterwards what appeared to be the same species on an old wall at Somahoz, but the labours of M. Reuter, in the 'Prodrômus,' have rendered it impossible to determine the species of an *Orobanche*. It is very possible that a skilful botanist may distinguish species, where the differences are inappreciable by a less practised eye; but unless he can point out some characters which would enable a brother botanist to identify his plants, he renders the science only the more obscure by publishing them.

To return to La Peña: *Ficus carica* grows in the crevices of the rocks, and if not an original native, is now perfectly naturalized. Bushes of *Quercus Ilex* are found with prickly leaves: I mistook it at first for *Quercus coccifera*. At the foot of the Peña, in a meadow crossed by a track leading from some quarries down to the shore of the harbour, we find great abundance of *Serapias cordigera* mixed with the rarer *S. Lingua*, and I believe it was here that I gathered some specimens agreeing perfectly with *S. stricta* of Welwitsch, which is, I think, the *S. parviflora* of the 'Prodrômus.' *Carum verticillatum* occurs on the same spot: and a little farther from the Peña, at the head of the bay, on a flat moorish tract not much elevated above the tide, I met with *Simethis bicolor* plentifully, *Pinguicula lusitanica*, *Cicendia filiformis* and *Illecebrum verticillatum*. One would prefer to find plants not known in England, but there is great pleasure in meeting with those we have formerly thought it a triumph to find in our own country.

Another interesting walk is towards the mouth of the harbour. There is a delightful footpath a little way from the edge of the low cliffs which form its shore, and though the mountains are the same as those we admired from Fuente del Mar and from La Peña di Castillo, they present themselves in new forms and with new combinations. One of the first objects in this direction is an *Iris*, growing in company with *I. foetidissima*; it is perhaps *I. pumila*, but I saw no trace either of flowers or fruit. The two species of *Serapias* are abundant, and we have likewise *Ornithogalum narbonense* and *Allium fallax*. *Cynosurus echinatus* and

*Briza maxima* also invite our attention. Continuing my walk, I found in a cornfield *Cephalaria syriaca*. The almost sessile heads, and those on long stalks, on which DeCandolle founds two varieties, sometimes occur in the same plant; and he does not notice the very prolonged receptacle, which is a striking character. *Sedum Cepaea* also occurs in this walk, *Tolpis barbata*, *Picridium vulgare*, and *Adiantum Capillus Veneris*, which however I did not see.

The land forming the north side of the harbour of Santander terminates in a peninsula, and an island on which they are now building a lighthouse. The peninsula is composed of limestone rock, a large portion of which is covered by sand-hills. I expected to find here the plants which abound on the sand-hills at Biarritz, but the best are wanting. Those observed there which I have not already noticed were *Dianthus gallicus*, *Medicago striata*, *Herniaria glabra*, *Pulicaria odora*, *Linaria supina*, *Scrophularia canina*, *Veronica prostrata*, and *Sclerochloa Triticum*. Another set of sand-hills between this peninsula and the present lighthouse affords *Artemisia crithmifolia* and its parasite *Orobanche arenaria*, and *Allium sphærocephalum*. There is a large extent of sand-hills on the opposite side of the mouth of the harbour, which are heaped up to a considerable height above the limestone rock; they offer every step of the progress from loose blowing sand to a close covering of turf, but I found hardly anything which I had not previously noticed. There was one bush of *Cistus salvifolius*. I had expected to find Spain full of *Cistus*; but this plant, another at Las Caldas, and one or two others, all of the same species, at Bilbao, were all that I saw of the genus. *Juncus acutus* is very abundant on these sands, and I got *Arabis ciliata*, *Medicago marina*, *Ætheorhiza bulbosa*, *Cynoglossum pictum*, *Plantago montana*, and in a moist spot *Lastræa Thelypteris*.

I have still a few gleanings of the country near Santander. On the shores of the Bay of Biscay I found *Linaria græca*. On the road towards Burgos, which sets off westward instead of eastward from Santander to get round the head of the harbour, there is a range of hills on a base of limestone: I visited it twice. They present a remarkable feature, which also prevails among those towards the lighthouse: it is the frequent occurrence of conical depressions or craters, which one might fancy to be volcanic, did the nature of the soil permit such a supposition. They are of different sizes, mostly filled up with trees or brushwood, and often ranging in lines, which seem to occupy the position of a continuous valley. The woods on these hills abound in *Arbutus*.

*Pulicaria odora* is pretty plentiful in one part; *Euphorbia dulcis* and *Thesium pratense* may be met with, and a *Daucus* just coming into flower, which perhaps may be different from *D. Carota*. I also observed an *Ophrys* with a short forward point like that of *O. arachnites*, but it was entire, rather favouring the idea that this is only a variety of *O. apifera*; but I did not see any plant of *O. aranifera*, and I am not disposed to believe it a hybrid.

On the 5th June I went up to a village called Las Corales, and on the 11th made a hasty trip to Reinosa. On the 21st I was again at Reinosa and went on to Pozazal. On the 25th I went to Alar, and on the 1st July returned to Santander. There is a railway now in progress from Santander to Alar, whence perhaps it may at some future period be continued to Valladolid and to Madrid. The part now completed occupies the summit level, at least as far as the road to Valladolid is concerned. It extends about thirty miles from Reinosa to Alar, and at Pozazal (pronounced Pothathal) the highest station attains an elevation of 3300 feet above the Bay of Biscay. Reinosa is forty-two miles from Santander, but it is expected that the railway for the greater part of this distance will be completed in the autumn of 1858. The remaining portion, which includes the most difficult part of the ascent, will require at least another year. The present journey to Reinosa is performed by diligences, passing through Torre la Vega, which will not be touched by the railway. Torre la Vega is situated in a beautiful vallèy well watered and well cultivated, with a mixture of trees, and surrounded by hills of varied forms, generally woody, sometimes rocky. It is seated in the valley of a little river called the Bisaya, the course of which we ascend through a narrow gorge to Las Caldas, a place, as its name implies, of hot springs. These rise just where the limestone rock makes its appearance, from under the beds of a hard sandstone. This limestone rises into mountains of considerable elevation, forming the northern boundary of the valley of Las Corales, in which the lower hills are mostly of a loamy soil, attributed to the greensand. Las Caldas would be a good botanical station for a few days, as these three soils would each contribute some peculiar plants, the best being probably in connexion with the limestone; but my stay there was very short: *Nasturtium pyrenaicum*, *Sedum dasyphyllum*, *Ligusticum pyrenæum*, *Eryngium Bourgati*, *Galium sylvaticum*, and *Valantia hispida* being my chief prizes, together with several species found in England on the chalk and on the mountain limestone.

I was three or four days at Las Corales—not, I think, a parti-

cularly good station for botany. Besides *Simethis*, *Teucrium pyrenaicum*, and some other plants before enumerated, I got *Lathræa clandestina*, *Anarrhinum bellidifolium*, *Lactuca tenerrima*, *Ononis mollis*, *Linum hirsutum*, *Orobis sylvaticus*, *Quercus pubescens*, *Sisymbrium austriacum*, var. *acutifolium*, and *Arenaria montana*, all of which would probably be found about Las Caldas.

Leaving Las Corales, we again ascend the course of the Bisaya through another gorge penetrating a very hard sandstone, which again opens into another valley, and from this a third and more magnificent gorge leads us to Reinosa. The proposed railroad is to pass through the two lower defiles; but the upper ascends too rapidly (1 in 17) for a railroad to follow it, and it will have to make a wide circuit. I observed a *Cacalia* and two or three other alpine or subalpine plants on some wet rocks in this upper gorge, probably brought down by the torrent, for we are far from having reached an elevation to account for their presence.

Reinosa is 3000 feet above the Bay of Biscay. The highest springs of the Bisaya are within two miles from it; but the town stands on the Ebro, whose nominal source is about five miles distant. I say nominal, because it appears to me that in this, and some other cases, a copious and permanent spring receives the honour of the name, while in fact the highest waters are several miles distant. The highest waters of the Ebro are, I apprehend, to be sought for in one of the snowy Sierras which we see from Santander, and probably in the highest of them, the Sierras Albas, though I am not sure that we see these from Reinosa. The most conspicuous of those we do see are the Sierras Sejos, which are real craggy mountains, retaining a good deal of snow at the beginning of July even on their southern faces. The hills immediately about Reinosa have rounded forms much like those of our Sussex chalk hills, but on a larger scale. Even these retained some patches of snow all through the month of June.

The general appearance of the vegetation at Reinosa is very different from that at Santander, and the climate is very different; very cold in the winter with immense quantities of snow, while the summer is hot from the unclouded sunshine. My first walk was to some low, but somewhat rocky, hills near the railway station. Here I gathered *Ophrys lutea*, *Scandix australis*, and a beautiful blue *Linum*, which, however, I found in much greater perfection in my walk the next day on the north side of Reinosa. It is, as well as I can make out, *Linum reflexum* of Hort. Kew.; though the reflexed lower leaves do not form a constant character.

The next day my walk was in the opposite direction, where I found, besides the *Linum* already mentioned, another species, which is probably a var. of *L. salsoloides*, though the open flowers are quite white, or with a faint tinge of yellow, while the buds are decidedly yellow. As the yellow-flowered *Linums* are usually considered to form a division of the genus, this rather puzzled me. These were on a small rocky knoll at the foot of the larger hills, and with them a variety of *Astragalus monspeliensis*, some of it with pink and some with yellowish flowers.

The meadows on the way to this knoll were filled with a handsome erect variety of *Campanula Rapunculus*, *Orobis albus*, and *Pedicularis comosa*. This *Orobis*, however, has the stipules fully as long as the common stalk; while in what I suppose to be *O. canescens*, which I met with afterwards, the common stalk is very short, hardly one-fourth of the length of the stipules. A little beyond these meadows, at the foot of the hills, grows *Vicia Onobrychoides*, a beautiful species. I may add to the plants of this place, *Alyssum campestre*, *Biscutella saxatilis*, *Erucastrum obtusangulum*, *Helianthemum polifolium* and *canum*, *Medicago suffruticosa*, and *Coronilla coronata*. *Carum bulbocastanum* is abundant in the corn.

On the 13th of June I went on the railroad as far as Pozazal, but an attack of illness prevented my researches and sent me immediately back to Reinosa, and afterwards to Santander, so that *Orchis pallens* and *Scorzonera humilis* were all I took back with me. On the 23rd I again went to Pozazal, and availed myself for a few days of the hospitality of Mr. Ross at the station. A rough hill gave me a *Scorzonera*, which I have not been able to determine. I saw afterwards a specimen of the same plant in the herbarium of M. Darracq at Bayonne under the name of *S. humifusa*, but that gentleman could not tell me where it was found or what was the authority for the name. It does not occur in Steudel nor in the 'Prodromus,' and is very badly applied to a plant with an upright, single-flowered scape. The description in the last-mentioned work of *S. crispa*, a plant of the Crimea, approaches more nearly to it than any other I have met with; but the neck of the root is not at all fibriferous, and among a great number of plants I saw no indication of a second flower. On this hill, which is on the side of the road opposite to the station, I also gathered *Dianthus pungens* and *Serratula humilis*. *Carduncellus mitissimus* is very abundant here and elsewhere. On the same side of the railroad as the station are some barren fields, cultivated, but



apparently to little profit, divided by banks adorned with a few bushes—a sort of rudimentary hedge. Here I procured *Tragopogon crocifolius*, whose flowers, half yellow and half purple, were very conspicuous; *Achillea nobilis*, *Senecio Doronicum*, and *Thapsia villosa* just coming into flower; *Smyrnum perfoliatum*, *Arenaria grandiflora*, *Rapistrum rugosum*, *Hypericum hyssopifolium*, *Coronilla coronata*, *Vicia onobrychoides*, *Teucrium Polium*, *Stachys Heraclea*; another *Stachys*, whose name I have not determined, which resembles *S. recta* in habit, but is sufficiently distinguished by its numerous flowers (15 to 20 in a whorl), and by the floral leaves all exceeding the flowers; *Sideritis scordioides*, *Salvia Æthiopis*, *Cynoglossum cheirifolium*, *Aristolochia rotunda*, *Asphodelus ramosus*, *Allium roseum*, and *Echinaria capitata*. A variety of *Genista hispanica* with soft spines, *Prunus Mahaleb*, *Arenaria montana*, *Geranium sylvaticum*, *Trollius europæus*, *Ribes grossularia* with fruit hardly larger than a currant, *Crepis paludosa*, and *Pinguicula grandiflora*, grow on some hills a little farther to the south, where there is an ancient wood of oak and beech. Some of the trees are very large, but the best have been lately cut down for the use of the railroad.

There is a morning train from Reinosa at half-past six, reaching Pozazal at six minutes past seven, returning in the evening by that place at thirty-one minutes past eight, and arriving at Reinosa at nine. A botanist may therefore very conveniently fix his headquarters at Reinosa to visit the neighbourhood of Pozazal, or even of the two following stations, where I did not stop, and where, as seen from the railroad, there is no very promising locality. The station for Aguilar is about two miles from the town; but this, with its picturesque castle and varied neighbourhood, would seem to be well worth a visit, perhaps a lengthened one, especially if the botanist should be tempted to visit some very bold snowy and craggy mountains visible from the railroad in that direction. I must observe that these notes on Spanish botany apply only to the plants of the lower country. I did not attempt to scale any mountain; but the Sierras Albas, which are visible from about Santander, always retaining a considerable body of snow, and those still more abrupt ones behind Aguilar, cannot but offer a number of interesting plants. Mountains said to be still more lofty occur farther west, in the Asturias.

About two miles from the station at Aguilar, on emerging from a very short tunnel, we find a village called Villa Escusa. Unfortunately the train does not stop there; but I was indebted to

Mr. Mould for the opportunity of visiting the hill above it called Congusto, a very curious eminence from the labyrinth of detached and fantastic limestone rocks which crown its summit, and particularly interesting to the botanist from the number of good plants which grow upon it:—

<i>Alyssum montanum.</i>	<i>Serratula nudicaulis.</i>
<i>Sisymbrium</i> — ?	<i>Centaurea</i> — ?
<i>Arenaria tetraquetra.</i>	<i>Thymus vulgaris.</i>
<i>Arenaria conimbrensis.</i>	<i>Stachys</i> — ?
<i>Linum salsoloides.</i>	<i>Coris monspeliensis.</i>
<i>Linum salsoloides</i> , yellow-flowered.	<i>Rumex bucephalophorus.</i>
<i>Linum reflexum</i> ?	<i>Euphorbia serrata.</i>
<i>Rhamnus alpinus.</i>	<i>Ophrys lutea.</i>
An <i>Umbellate</i> : undetermined.	<i>Ophrys tenthredinifera.</i>
<i>Saxifraga</i> — ?	<i>Anthericum Liliago.</i>
<i>Hieracium</i> — ?	<i>Trifolium</i> , perhaps <i>cæspitosum</i> , but more woody than usual.

The *Sisymbrium* here mentioned is in many respects like *S. austriacum*, but it is a much smaller plant, 4 feet high instead of 2 feet, and the pod is longer in proportion and much more slender. The *Linums* are those I have already mentioned. The *Umbellate* was not far enough advanced to show the nature of the seeds. The root-leaves were simply pinnate, oblong in the outline; the leaflets sessile and almost as broad as long, incise, and the lower ones almost palmatinerved. The stalk spreads out into a broad sheath with a membranous margin. The stem-leaf pinnate, with few, linear-lanceolate leaflets. Bracts one or two. Bracteoles about 5. Calyx obsolete. Flowers pinkish, not at all radiant.—The *Saxifrage* belongs to the division *Dactyloides* of Tausch, and to my division C. ii. a. M. Darracq pronounced it to be the *S. ladanifera* of Duby, *pedatifida*, Auct.; but that has the leaf deeply divided into three parts, and these again more or less subdivided: the plant of Congusto has thick fleshy leaves, not viscid when fresh, but exuding a gummy matter along the margin in drying. They end in 3 or 5 teeth without any deep separation; the barren shoots are not much lengthened, and the whole plant is rigid to the touch. The haft is not longer than the blade. Teeth of calyx very blunt. Quære if *S. capitata* ?

My next plant is a *Hieracium*, and I am almost tempted here to repeat the remark I made on *Orobanche*. This plant seems to belong to the *Villosæ*, or perhaps to the *Andryaloïdes*, for the hairs

of the leaves and stem are feathery. As far as I have seen, it is one-flowered, very villous, with one or two very small leaves on the stem. Root-leaves broadly oval, attenuated sometimes rather abruptly into the haft, quite entire. I cannot find a place for it even in the multitudinous species of Grenier.

The *Centaurea* is stemless; the flowers yellow, two or three together on the crown of the root. Leaves pinnatifid. It resembles in habit *C. mixta*, a plant of Greece and of Asia Minor, but the outer and middle phyllaries terminate in a simple, somewhat dorsal spine without any accessory spines, and the appendage of the inner is narrow, terminating in 3 or 5 small prongs, instead of the broad papery membrane of *C. mixta*.

The *Stachys* is the same as that noticed at Pozazal.

Another hasty excursion took me from Pozazal to Alar. Before reaching the latter place we leave the limestone and all the supposed appendages of the greensand, and enter a country of gravelly hills. At first the boulders are large and often cemented into rock. As we advance, they are smaller, and with less solidity, and beyond Alar the hills gradually sink down into a sandy plain, which extends all the way to Palencia, and I believe to Valladolid. In the first part, however, these hills are varied and picturesque, though deficient in wood. They might be visited either on foot or on horseback from Villa Escusa or from Alar, where there is, for Spain, a very good inn. At Alar I gathered *Silene conica* and *S. conoidea*. The habit of these is sufficiently distinct to attract attention, and the much greater size of the seeds in *S. conoidea* affords a decisive character. *Helianthemum canum*, *Helianthemum hirtum*, *Helianthemum Tuberaria*, *Dorycnium fruticosum*, *Orobis canescens*, *Scorzonera hirsuta*, *Evax pygmaea*, *Micropus erectus*, *Convolvulus lineatus*, and *Thymus striatus*, Benth., *T. zygis* I believe of most authors.

The botany of the Pyrenees is too well known for me to think of adding to it, unable as I now am to scramble over mountains, and especially as each time I went up into their valleys I became ill. I may, however, make a few remarks for the use of those who, like myself, are not equal to prolonged exertion. At Pau, a few mountain plants are brought down by the Gave, and find a home on its wide bed of gravel. The valley at Eaux chaudes offers several interesting plants. There is a good carriage-road to Gabas, about six miles above Eaux chaudes. There you are at the foot of the Pic d'Ossau, and a mule-road passes thence into Spain, which,

rising as all these Pyrenean passes do to a considerable elevation, must offer some alpine plants to the botanist. Near Bagnères de Bigorre rises the Pic de l'Hieris, a mountain covered with pine-forests, and celebrated for its botany; which however, though mountainous, is not alpine. A few miles from Bagnères de Luchon is the Val d'Esquierri, also famous for its botany. After passing the little village of Oo, you ascend a shivery bank on the right, the upper part of which is craggy and woody; but the rocks are not firm, and on horseback the ascent is rather a nervous affair. Above this you enter a grassy valley with a rich variety of plants, rather however subalpine than alpine; but the slopes which bound it on each side ascend to patches of snow. I met two botanists as I descended, who were prepared to pass a night on the mountain—the only way of examining thoroughly its productions. The Port de Venasque is also visited from Bagnères de Luchon; but I apprehend the best station for examining this neighbourhood would be the Spanish town of Venasque, where there is, I am told, a very tolerable inn, much better than the Hospice on the French side, and where you are immediately at the foot of the mighty Maladetta.

We returned by Cette and Arles, taking advantage of the railway from Toulouse. At both these places there is a good warm-country botany, and of a very different character in each place; Cette presenting limestone rock and the sands of the sea-shore, while about Arles all is gravel. The uncultivated lands about Nismes will also gratify the botanist with several interesting plants delighting in a limestone soil; and various points above Arles and about Orange, and some other places among the gravelly hills which there bound the immediate valley of the Rhone, will afford him abundant opportunity of examining the productions of that soil. The railroads now make all these places easily accessible.

If any botanist should be disposed to follow me in a visit to the N. of Spain, the foregoing observations may perhaps help him to direct his steps. The Pyrenees are so well explored, that there is no hope of making new discoveries among them, unless indeed they be founded on those nice and almost intangible distinctions which seem now to be in favour with many of the French botanists. With the range of high land which forms a continuation of the Pyrenees along the north coast of Spain, the case is far different. Their productions are comparatively little known; and though neither so high nor so abrupt as that part of the chain which separates France from Spain, yet, as in the Asturias the mountains rise to the

height of 10,000 feet, and in many other places to seven or eight thousand, they must offer great varieties of soil and situation. An accomplished Italian botanist is said to be about to publish a flora of the whole range, from Rosas on the Mediterranean to Cape Finisterra; but one man cannot exhaust so extensive a subject, and the book when published would be a useful guide for future explorers. If an English botanist should then be disposed to visit the North of Spain in 1859, he will probably find the steamers either from Liverpool or from Southampton on a better footing than they are at present, and there would doubtless be some improvement in those from Bayonne. At Santander such a traveller would stay two or perhaps three days, visiting the Peña di Castillo, the sands at the mouth of the harbour, those towards the lighthouse, and the shore of the Bay of Bisçay for two or three miles west of the lighthouse. The railway would then take him to Las Caldas: I doubt if he would find it worth while to stop before reaching that place, as he is likely to find little which would not be obtained either at Santander or at Las Caldas. At Las Caldas he would have employment for three days at least on the sandstone of the gorge, on the limestone to the east, and on the loamy wooded hills to the west of the station. An interesting walk from Las Caldas would be across the plain of Las Corales to Somhoz, where crossing the river and turning to the left he will have another pleasant walk over some eminences partially covered with wood. Thence he may descend into a rocky valley nearly parallel to the Bisaya, and again keeping to the left return by the right side of the river, and explore the singular bank which divides the basin of Las Corales into two parts, one 20 or 30 feet higher than the other. A third and most magnificent gorge leads to Reinosa, and this gorge would be worth a day's examination. Above this, I believe I can add nothing to what I have already said as to localities. Reinosa might be the head-quarters for visiting three mountain masses: the Sierras Albas, the Sierra Sejo, and a third range to the east of the road, whose name I forget, but which, though perhaps not so high as the others, is yet sufficiently elevated to preserve some snow in its hollows throughout the year.

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Note on the Genus *Hemigymnia*, Griffith. By THOMAS THOMSON, Esq., M.D., F.R.S., F.L.S., Superintendent of the Calcutta Botanic Garden.

[Read February 18, 1858.]

BOTANISTS will be glad to learn that a valuable contribution to our knowledge of the little-known flora of Malwah in Central India has recently been made by the labours of Lieut. Beddome, of the 42nd Regiment M. N. I., who has resided more than a year in the province, and has communicated to me many interesting specimens, as well as a catalogue of the plants of the vicinity of Jubbulpore, for publication in the 'Journal of the Asiatic Society of Bengal.'

In a notice of some plants of this little-known province, collected by Mr. M'Leod, Griffith\* published a new genus of *Verbenaceæ*, under the name of *Hemigymnia*, which he considered nearly allied to *Tectona*, but readily distinguishable by the included stamina, the styles twice bifid, as in *Cordia*, and the fruit supported by the persistent calyx, which does not enclose the fruit as in *Tectona*.

As the original specimens of the plant on which the genus *Hemigymnia* was founded have not been seen by any botanist but Griffith, the brief description contained in that author's paper, and repeated in DeCandolle's 'Prodromus,' vol. xi. p. 697, is all that is known on the subject. These specimens, which were perhaps very imperfect, are probably still in the India House, where Griffith's original collection is believed to exist.

Among other interesting plants, Lieut. Beddome has sent excellent specimens of a tree which he considers to be Griffith's *Hemigymnia*. In this I have no doubt he is correct, for, except in one point, it agrees very closely with the description; and its native name *Deyngan*, though not identical with that assigned by Mr. M'Leod to *Hemigymnia* (*Dahman* or *Dahyan*), is so similar, that in all probability both are intended to represent the same sound.

Griffith's description having been transferred by Schauer with only some verbal alterations to DeCandolle's 'Prodromus,' it is not necessary to repeat it here. Lieut. Beddome's plant has an infundibuliform, striated, five-toothed calyx. The tube of the corolla is cylindric rather than infundibuliform; but the limb has five narrow oblong segments, nearly twice as long as the tube. There

\* M'Clelland's Journal, iii. 361.

are five stamens alternate with the lobes of the corolla, and a four-celled ovary with one solitary ascending ovule in each cell. The style is twice bifid; and the fruit, still immature, is rostrato-cuspidate and "calyce cupuliformi semicinctus."

Lieut. Beddome's plant, however, differs from Griffith's description in its alternate (not opposite) leaves, and is an undoubted species of the genus *Cordia*, as now generally understood. Still, the agreement of every other character is so complete, that I cannot but think that Griffith has been misled by imperfect specimens to regard the subopposite arrangement of the leaves, so commonly seen close to the cymose inflorescence of many species of *Cordia*, as a constant character; and I feel equally certain that the supposed opposition of the leaves, and a certain general resemblance in foliage to *Gmelina*, and in flowers to *Tectona*, further led him to consider this plant Verbenaceous, notwithstanding the striking character of the division of the styles, to which he nevertheless directs attention as indicating an affinity with *Cordia*.

Turning to the described species of *Cordia*, I find a plant described by Wallich (Roxb. Fl. Ind. ed. Carey & Wall. ii. 329; Wall. Cat. 897; *C. Wallichii*, Don, Syst.; D.C. Prod. ix. 479) under the name of *C. tomentosa*, with which Mr. Beddome's plant should be compared, not only on account of a general agreement in the brief character assigned to it, but because it was described by Wallich from Heyne's collection, and may therefore not improbably have been obtained from the province of Malwah. As no specimens of Wallich's *C. tomentosa* exist in India, I have sent a small specimen of Mr. Beddome's plant to Dr. Hooker, with a request that he should compare it with the Wallichian herbarium and append the result to this note.

Should my conjecture prove unfounded, there are two other species of *Cordia* with which I think our *Cordia* will prove allied, and with which it should be compared, before it can be considered as new. These are, *C. ovalis*, R. Br., ? D.C. Prod. ix. 479, and *C. amplifolia*, Alph. D.C. Prod. ix. 481. This last is said to produce a valuable timber, agreeing in this point with the Jubbulpore plant.

There can be little doubt but that all these plants are closely allied; and the African origin of the last two affords an additional proof of the curious resemblance of the flora of Western India to that of Eastern Africa, as has already been pointed out in the 'Flora Indica' (Intr. p. 113), and which is strengthened by every addition to our knowledge of the botany of the province of Malwah especially.

*Note by Dr. J. D. Hooker.*

Lieutenant Beddome's plant (Griffith's *Hemigymnia*) is undoubtedly a species of *Cordia*, as Dr. Thomson conjectures, and allied to the *C. abyssinica*, Br. (*Varronia abyssinica*, D.C.), differing, however, from that plant in the pubescent upper surface and dense white woolly tomentum of the under surface of the leaves, which extends over the petioles, ramuli, peduncles, and calyces; its corolla is also much smaller. On the other hand, *C. amplifolia*, A. D.C., and *C. Wallichii*, Don, are both closely allied to *C. myxa*, and have terete, not grooved calyces. Of *C. ovalis*, R. Br., too little is known to speak decidedly. I have found imperfect specimens of the same species in Dr. Stocks' collections, but without any habitat; and others, also without a habitat, have been received from Dr. Gibson, in both cases probably from Central India. I may add, that I find in Dr. Thomson's Kumaon collections fruiting specimens of another anomalous Cordiaceous plant, *Gynaion vestitum*, A. D.C. (in D.C. Prodr. ix. 468), gathered at the same spot as those by Edgeworth, and originally described by A. D.C. - It is, as A. DeCandolle himself suspects, a *Cordia* allied to *C. Griffithii* and *C. abyssinica*. I append diagnoses of both.

**CORDIA M'LEODII** (*Hf. & T.*). Arborea, ramis robustis, ramulis foliis subtus inflorescentiaque dense fulvo-tomentosis, foliis late ovatis ovato-cordatisve obtusis margine subsinuato undulatis coriaceis supra pubescentibus, floribus corymbosis, calyce tubuloso sulcato 5-fido, corollæ lobis parvis angustis.

*Hemigymnia M'Leodii*, Griff. in Calc. Journ. Nat. Hist. 1843, iii. 363; Schauer in D.C. Prodr. xi. 697.

*Hab.* In India centrali; Malwah! *Griffith, Beddome*. Concan? *Gibson, Stocks*.

**CORDIA VESTITA** (*Hf. & T.*). Ramis robustis, ramulis foliis novellis et inflorescentia dense sericeo-lanatis, foliis late ovatis elliptico-ovatisve acuminatis coriaceis supra scaberulis subtus pubescenti-tomentosis subsinuatis villosiusculisve, floribus polygamis cymoso-paniculatis, calyce sulcato 4-6-lobo lobis patentibus.

*Gynaion vestitum*, A. D.C. Prodr. ix. 468.

*Hab.* In Himalaya occidentali tropica; Garwhal ad Pau, alt. 3000-4000 ped.! *Edgeworth; T. Thomson*.



## Note on some Suprasoriferous Ferns.

By THOMAS MOORE, Esq., F.L.S.

[Read May 5th, 1857.]

THE normal condition of the majority of the Ferns, as is well known, is to produce what is called their fructification, on the under surface or the back of their fronds, and hence they are called dorsiferous. There are, however, some remarkable deviations from this rule among the Ferns which belong to the dorsiferous class.

Some time since, in the "*Nature-Printed Ferns of Great Britain and Ireland*," I had occasion to mention the fact, that certain varieties of the common Hart's-tongue Fern (*Scolopendrium vulgare*), habitually produce sori on the upper as well as the under surface of their fronds. This occurs, for the most part, on those varieties, several in number, in which the margin is crenately lobed. In these cases, it often appears as if the normally-placed sori had been continued so as to reach the margin at the acute sinuses of the lobes, and then returned on the opposite surface; but it also frequently happens that the abnormally-placed sori are distinctly within the margin, and borne where there are no corresponding sori beneath.

Subsequently another example of this kind has been recorded by Sir W. Hooker\*;—an aspidioid suprasoriferous *Polypodium* found in Ceylon. I have now to mention a still more remarkable instance, occurring in a totally different group of ferns, in which the fructification is normally marginal.

Some time ago I was favoured by my friend Mr. C. Moore, the Director of the Botanic Garden at Sydney, with some fronds, cultivated in the Sydney garden, of one of the Ferns he had obtained from New Caledonia. This fern, named after him *Deparia Moorii* by Sir W. Hooker†, I have already, under the name of *Cionidium*‡, brought under the notice of the Society as forming a Deparioid genus, with reticulated veins. *Deparia* normally bears its spore-cases within little cup-like involucre, standing out from the extreme margin of the fronds on little footstalks, and the same kind of structure occurs in *Cionidium*. In the specimens of *Cionidium Moorii*, above referred to, these normally-placed marginal exserted sori were abundant; but in addition to them were other perfect sori scattered here and there, both on the upper and under surface, entirely removed from the margin, sometimes even almost

\* Kew Journal of Botany, viii. 360, t. 11.

† *Ibid.* iv. 55, t. 3.

‡ Proceedings of the Linnean Society, ii. 212.

close to the midrib, and considerably more numerous on the upper than on the under surface. These surface-sori, in all the instances examined, proved to be furnished with the usual involucre beneath the spore-cases, but were apparently without any pedicel (the latter being, however, very short in the marginal sori of this plant), so that they were similar in character to those of *Woodsia* and *Hy-poderris*, or as to position to those of the true (net-veined) *Aspidiums*, being placed directly on the network of veins.

The inferences which may, I think, be drawn from these instances of anomalous structure, are, (1) that the veins are important structures in the economy of fern development, since they thus appear capable of originating the receptacle and spore-cases from their surface in any part—even in unusual parts—of the frond; and (2) that sufficient importance seems thus to attach to them, to justify their employment for the purpose of assisting in the definition of genera, in a family of plants where something more than the so-called fructification itself is confessedly needed to supply distinctive characters.

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Description of a remarkable spike or bunch of Fruits of the Fig Banana (*Musa sapientum*), var. By Sir ROBERT H. SCHOMBURGK. Communicated by GEORGE BENTHAM, Esq., F.L.S.

[Read June 2nd, 1857.]

A VARIETY of the Banana is called here (that is to say in the Island of Saint Domingo) Guineo, and known in some of the English West India Islands as the Fig Banana. There is no outward mark of difference between a common Banana tree and that of the Guineo: the fruit of the latter is, however, much smaller, rounder, somewhat pointed on the opposite end, not unlike a fig, and of a much sweeter and far more delicious taste than the large Banana, resembling not only in odour, but likewise in taste, our apples, from which circumstance it has been called Guineo-Manzana or Apple Guineo, to distinguish it from the Martinica-Manzana or Martinique Apple Banana. The latter are the fruits of the so-called Chinese Dwarf Plantain (*Musa chinensis* of Sweet, which Paxton has re-christened *Musa Cavendishii*). This species was introduced into Santo Domingo from Martinique. The stem seldom reaches a height beyond 8 feet, and the racemes or branches of fruits are of such a size, that they touch the ground, containing

from three to four hundred fruits, resembling a plantain in miniature by their being not so round, and somewhat angular, like the common plantain.

A few days ago, His Excellency Señor Buenaventura Baez, the President of the Dominican Republic, aware of the interest which I take in all that refers to Natural History, sent me a bunch of the kind of Bananas called Guineos, which differed in a very remarkable manner from any I had ever seen before; nor have I as yet found any person in Saint Domingo who had previously seen anything similar.

In the usual mode of inflorescence of the Plantain and Banana, the fertile flowers are produced in successive rows, and these having ceased, are succeeded to the end of the stem by barren flowers, none of which produce a fruit. Some botanists have therefore considered the genus *Musa* as unisexual by abortion.

The accompanying drawing of the bunch of Bananas which I received from his Excellency the President, shows a most remarkable deviation from the general rule. The upper part of the raceme, nearest to the stem, consists of eight rows of the Fig-Banana, numbering 125 full-grown fruits of that kind. After the eighth row, follow seven series of barren flowers, when, contrary to the usual mode, a new series of fertile flowers springs up, consisting of thirteen rows, which have produced 420 fruits, smaller in size than those of the upper part of the raceme, and resembling the Martinica Manzana, or fruits of the *Musa chinensis*, only that they are much smaller than the fruits of that description in their natural state.

We have here the singular circumstance of the production of two kinds of fruits, of the same genus it is true, but hitherto considered specifically different, on the same spike, although the plants of both are individually different in growth, and the fruits different with regard to appearance and maturity. The upper parcel of Fig-Bananas were all in full maturity, and commenced to fall off from the stem (as is the case when the Banana has reached its full ripeness), on the 11th of October, while the lower parcel of fruits began only six days later to assume a yellow colour.

The appearance of two different kinds of fruits on one and the same stem, reminded me of a somewhat analogous case in a family not many links removed from the *Musaceæ*, namely, the production, on the same spike, of flowers of *Monacanthus*, *Myanthus*, and *Catasetum*, formerly supposed to be different genera belonging to the

family of the *Orchidaceæ*; my account of which is published in the "Linnean Transactions," vol. xvii. p. 551.

I have to regret that I did not see the raceme of the Banana, now under consideration, when it was in flower, or at any early state of its growth; for, although it was produced in a garden within the city, I knew nothing of it, until it was sent to me by President Baez; but as the flowers of Plantains and Bananas, including all the different varieties of the latter, are so much alike, even a botanist might have passed the tree without his attention being attracted; and this remarkable play of nature would only become observable when the lower series of flowers commenced to form themselves into fruits.

It affords, however, an additional instance in favour of the opinion which I have already expressed (when giving an account in the "Linnean Transactions" of the production of flowers on the same spikes of three different presumed genera of the order *Orchidaceæ*), that with regard to genera and species, we must prepare ourselves for remarkable discoveries.

Plants under cultivation are much more subjected to such freaks of nature, than when growing in their own soil and climate, left to themselves. I know, from my own experience in Saint Domingo, how little reliance can be placed upon the colours of fancy flowers, such as roses, dahlias, pinks, asters, &c.: even in cases where the mother-plant from which came the cuttings (in the case of roses or pinks), the roots (in the case of dahlias), or seeds (in the case of asters, &c.), were double, single flowers have succeeded. For example, cuttings from roses of the China-stock will, notwithstanding their having produced one year flowers of the variety of which they bear the name, revert perhaps the next year or later to the Chinese rose of old standing; and with regard to dahlias, they have produced single and double flowers of different colours on the same plant in my little garden. The latter happened in a very remarkable degree in a dahlia called "the Butterfly," which the second year produced double and single flowers on the same plant; here white, the leaves edged with maroon; there of a uniform deep maroon colour.

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## On Four Varieties of British Plants.

By JOHN HOGG, Esq., M.A., F.R.S., F.L.S., &amp;c.

[Read Nov. 19th, 1857.]

I BEG to present to the Linnean Society four or five varieties of British plants, which were collected by myself during the last summer.

The first is a white-flowered variety of the common scarlet Corn Poppy (*Papaver rhæas*, var. *flore albo*). I gathered a single plant in a potato-field, at some distance from the village of Norton, in the county of Durham, on September 18th. The petals, when fresh, were of a beautifully delicate white colour, having a small dark-red spot at their base. I only once before met with the like variety, which was also near Norton, more than twenty years ago; and which is recorded in the late Mr. Winch's 'Flora of Durham and Northumberland.' As far as I can find, no notice is taken of this variety, as a wild plant, in any other Flora of British plants.

The second is, the European Strawberry-tree, or *Arbutus unedo*, of which the varieties here presented are Irish specimens. After a search among our English and Irish works on native plants, I was surprised not to find any mention of these very distinct variations in the form and breadth of the leaves. The one, which I term var. *latifolia*, is a truly noble tree, its leaves much resembling those of the bay-tree, or *Laurus nobilis*, but with their tips often rounded. It is also very robust in its habit, and attains a large size. It was growing in the fissures of the compact grey limestone on the margin of the Torc Lake, or as it is otherwise named, the Middle Lake, at Killarney. The second, which I call var. *angustifolia*, I gathered from a small tree deeply rooted in the crevices of the same limestone rock, on the shore of the lower lake, on the same day, Aug. 21st last. This variety possibly agrees with the var. 7, *salicifolia*, 'willow-leaved,' of the London nurserymen, as mentioned at p. 1118 of Loudon's 'Arboretum et Fruticetum Britannicum,' vol. ii. edit. 2. I will not here enter on the disputed question of the indigenoussness of this beautiful tree, now so abundant about Killarney; but I will only observe against the affirmative side, that none of the *Arbutus* wood has ever, so far as I could learn from many inquiries in the island, been dug up with the other common sorts of bog-wood, among the peat or bogs of the south-west of Ireland.

In the town of Killarney there exists a considerable manufacture of work-boxes, writing-desks, tables, tea-caddies, card-

cases, and other fancy articles of varied and beautiful design, made with thin slices of the *Arbutus-wood*, veneered with skill. Numbers of the poorer class thereby gain a very good livelihood.

The third plant is perhaps only a remarkably large and luxuriant variety of *Astragalus hypoglottis*; or, indeed, it may ultimately be proved from its mature pods to be a distinct and foreign species. I first discovered three or four individuals of it in the summer of 1856, which were growing on the side of the West Hartlepool railway, near the Greatham viaduct in the county of Durham; but the dried specimens which I now exhibit, were gathered in July last, from one of the plants seen by me last year. For the better comparison of the ordinary form of *A. hypoglottis* with this abnormal one, I have attached also a dried and very old specimen of the true "Purple Mountain Milk-Vetch," which was gathered near the Queen's Ferry, Edinburgh.

Smith, in his 'English Flora,' vol. iii. p. 295, gives the entire length of the stem of the normal plant in Britain, as varying from "2-5 inches," and its leaflets are usually "small and ovate"; or rather, as Sir W. Hooker states, "elliptico-ovate." Withering also, in his 4th edition, vol. iii. p. 269, describes the number of leaflets in each leaf as from "six to twelve pairs with an odd one," terminating the leaf; and Mr. Babington says the leaflets are "in eight to ten pairs." Now, in my recent and larger specimens, the stems varied from about 12 to 14 inches in length, the entire stem being stronger but more straggling; the leaves containing fourteen or sixteen pairs of leaflets and a terminal one: the leaflets themselves are less ovate, and more elongated or lanceolate. The flowering stems are nearly double the length of those of the ordinary plant; the flowers are more numerous, and the flower-heads are larger and stouter. Indeed, the whole plant is altogether more robust and upright; and if a variety of *A. hypoglottis*, it presents a very luxuriant condition. At first I was inclined to think that it might be a foreign species (and from further examination of it I retain the same inclination) introduced with ballast, as it was found on the side of a railway only a few miles distant from a considerable seaport, West Hartlepool; and the ballast or ground in which it was growing was a mixture of sand and sea-shells much broken. But had it been growing in a very rich soil, this might have accounted for its remarkable luxuriance of size, and might have induced one to suggest that it might be cultivated, like tares or saintfoin, as food for cattle, with every prospect of success.

I have very recently, with the kind assistance of Mr. Kippist, looked over the species of *Astragalus*, which are preserved in the Linnean and Smithian Herbaria. In Linnæus's collection I did not see any foreign plant at all resembling it; but in Smith's own Herbarium, in the sheet of paper containing many dried specimens of *A. hypoglottis*, the variety marked No. 6 approaches my plant in the form of its leaflets, though not in the number of their pairs. This variety is an Asiatic one, being underwritten "Caucasus," communicated doubtless by Fischer. It is evidently a mere variety of our English *A. hypoglottis*, and retains its chief characters, the leaves excepted.

I next examined the plates in DeCandolle's beautiful '*Astragalogia*,' and observed in his engraving (Tab. 12) of *Astragalus purpureus*, a very considerable resemblance to my plant in its length of stem, its somewhat straggling character, and its general appearance; although its head of flowers is not represented so large, or its leaflets sufficiently long. It is a native of the South of France, chiefly growing in the mountains of Provence.

I will now briefly add DeCandolle's distinctions between *A. hypoglottis* and *A. purpureus*. In his later work, the '*Prodromus Syst. Naturalis*,' tom. ii. p. 281, he describes, No. 1, *A. hypoglottis*, . . . as "piloso-subvillosus" . . . "foliolis obovatis oblongis, sæpe emarginatis 8-10 jugis;" and its pod with one seed in each cell or division; whilst No. 3, *A. purpureus*, he details as being "subvillosus" . . . "foliolis obovatis apice bidentatis," and its pod as having in each division three seeds. Hence the chief differences, besides the seeds, between *A. hypoglottis* and *A. purpureus*, so pointed out, are the less hairiness of the latter plant, and the leaflets furnished at their tips with two small teeth: and, since the leaflets are more fully described in the '*Astragalogia*,' I will here give the passages relating to them:—

"*A. hypoglottis*.— . . . foliola 19-29, opposita, ovata aut ovato-oblonga, 3-8 millim. longa, obtusa aut sæpe in eadem planta apice emarginata, subtus incano-villosa; superne glabra aut pilis quibusdam onusta." (p. 118.)

"*A. purpureus*.— . . . foliola 23-29 opposita, ovato-oblonga, apice emarginata, vel potius bidentata et in sinu brevissime mucronata, pubescentia, aut villosa, 7-9 millim. longa." (p. 117.)

In the number of pairs of leaflets in the former plant there seems to be some error, for DeCandolle makes them 9-14, with an odd one, whereas in our English plant the pairs are only 6-12 at most, with an odd one; and in the '*Prodromus*,' the author

writes 8-10 pairs. In my variety the pairs are 14-16, with an odd one; whilst the bidentations on their tips, in any of them, are scarcely, if at all, perceptible. This, however, is a character likely to be variable in itself, and to assume in some specimens the appearance of mere emargination.

In addition to the greater length of the leaflets in my new plant, their under-sides are less hoary and villous than those of the *hypoglottis*. But I must remark, that the chief and best distinction between these two species is, if constant, the solitary seed in each cell of the bilocular pod of the *A. hypoglottis*, and the three seeds in each of that of the *A. purpureus*.

In examining, a day or two ago, with Mr. Kippist, under a lens and small microscope, an immature pod taken from the lowest flower from one of the heads of each variety or species, eight or nine ovules were plainly visible in each dissected pod; consequently, if the character be a good one, all the ovules except two,—that is, one in each cell in the pod of *A. hypoglottis*, and all, save six, in the pod of the new plant, if *A. purpureus*,—must, in ripening, continue immature or abortive. So I must wait until next summer to decide the accuracy of this distinction, when I hope to procure some mature pods from my variety, or new species. But I shall have no difficulty in obtaining the pods of *A. hypoglottis*, as this pretty plant is common on the sand-links near Hartlepool and Seaton.

Looking then to the more elongated form of the immature pod of my new specimens, and compared with the subcordiform and compressed shape of that of *A. hypoglottis*,—see fig. (a) of Plate 12, and figs. (a) and (b) of Plate 14, in the 'Astragalogia,' and which distinctions are apparent in the dissected young pods contained in papers B 3 and B 4;—I am more inclined to affirm that my recent plant is rather to be accounted as a variety of *A. purpureus*, without the bidentate tips of the leaflets,—the seeds having, most likely, been imported with ballast from Toulon or Marseilles to Hartlepool,—than as a variety of *A. hypoglottis*. And this opinion seems to be in some degree confirmed by the greater number of flowers in each larger head, the much longer peduncles, the greater number of pairs of leaflets, their more lanceolate form, their less hoariness and villousness, than those which respectively occur in *A. hypoglottis*\*.

\* After my paper was read, a gentleman present at the meeting stated that Baxter had figured, in his 'British Phænogamous Botany,' a variety of the *Plantago major*, which he thought was the same as mine. On looking, subsequently, at vol. iii. plate 207, I found that he has figured at No. 7, a small



The fourth and last plant I now submit to notice, is a most curious departure from the ordinary or normal form of *Plantago major*. I discovered three plants of it nearly together on July 13th of this year, in a meadow, at Norton, in the county of Durham. On examination, each single flower will be found to have grown into a separate spike of a close pyramidal form, and the entire flowering panicle or head to have put on a most distinct and compact pyramidal character; so the variety may be distinguished as—*pyramidalis*—*paniculis pyramidalibus densis*. Smith, in his 'English Flora,' vol. i. p. 214, says, "the rose-shaped variety, and the paniced one, are often kept in gardens for the sake of curiosity, and afford remarkable instances of vegetable transformation." He mentions two varieties:—"γ. *P. major*, *panícula sparsa*," figured in Bauhin, Hist. iii. p. 2. 503, *f.*; "δ. *P. rosea*," *ibid.*

On referring however to Bauhin's work, as alluded to by Smith, the woodcuts there given do not resemble my variety, which is by no means rose-shaped. In the accompanying paper (D.) I have dried two flowering heads of the usual form of the *Plantago major*, which were growing near this varied plant, in order that this curious yet very beautiful transformation may be the more distinctly apparent. The rest of the plant does not differ from the common growth of *P. major*.

Botanical Report on the North-Australian Expedition, under the command of A. C. Gregory, Esq. By Dr. FERDINAND MÜLLER, Botanist to the Expedition. Communicated by the Colonial Office.

[Read Dec. 17th, 1857.]

Sydney Botanic Garden, 20th May, 1857.

SIR,—I do myself the honour of transmitting to you a brief general report on my botanical researches, instituted during your exploration of intertropical Australia.

In order to elucidate how far I was justified to advance the general conclusions contained in the following pages, I beg to refer introductorily both to the extent and the directions of your tracks of exploration, along which I endeavoured to ascertain, not

head of the *Plantago major*, very like my transformed plant; but it seems less, and not so pyramidal in its entire form. Mr. Baxter describes it as var. η, and says it was discovered near Oxford, July 26, 1835.

only the nature of the vegetation, but also the range of its species. I beg further to observe, that I include in the following remarks all those plants which, during momentary interruptions of the voyage to the Victoria River, we were enabled to collect on the islands on the N.E. coast, as well as those obtained during our stay at Moreton Bay.

The plants thus accumulated illustrate, I think, almost completely the flora of Arnhem's Land, with the exception of the northern part, where it seems bamboo-groves and many other features of the Indian vegetation exclusively exist. They comprise further a nearly perfect flora of the Victoria River and its vicinity, as also of the dividing table-land or ranges between North Australia and the interior, less completely the vegetation of the north-western interior (as far as long.  $20^{\circ} 18'$  south, and lat.  $127^{\circ} 30'$  east), which may be considered as part of the flora of Central Australia. The collections formed during the last part of the expedition illustrate to a considerable extent the vegetation of the country around the south-west, south, and south-east part of the Gulf of Carpentaria, more or less remote from the coast, and finally the plants of the eastern tropical and subtropical parts of New Holland. My observations extend consequently from Point Pearce (the most northern place visited on the mainland in lat.  $14^{\circ} 30'$  south) to Termination Lake (our last position south-west, in lat.  $20^{\circ} 18'$  south, and long.  $127^{\circ} 30'$  east), and north-east as far as the lower part of the Gilbert River (in lat.  $17^{\circ} 15'$  south, and long.  $141^{\circ} 20'$  east) and south-east as far as Moreton Bay (lat.  $27^{\circ} 30'$ , long.  $153^{\circ} 20'$  east). Additions to the plants from these tracts of country form those procured on the islands of North-east Australia (from lat.  $15^{\circ}$  to  $10^{\circ} 45'$  south); and although the collections from these localities are very limited in land plants, they are of some value, as throwing light upon the phycology of that part of the globe.

In arriving at the conclusions advanced in the following pages, I availed myself of R. Brown's general remarks, appended to 'Flinders's Voyage,' and to Sturt's work on 'Central Australia;' of Allan Cunningham's appendix to King's 'Intertropical Survey of Australia;' of the botanical notes scattered through Sir Thomas Mitchell's work on 'Tropical Australia,' and through Leichhardt's 'Overland-Expedition;' and of Carron's 'Narrative of Kennedy's Expedition.' Besides these works, Mr. Brown's and DeCandolle's 'Prodromi' are almost the only important sources of information on the flora of the intratropical zone of this country.

In the absence of a general work of a recent date on those

plants constituting the polypetalous orders, we are, at least as regards Australia, but scantily acquainted with this section of the vegetable kingdom; and if, therefore, many plants noticed during the expedition are on this occasion pronounced as additional to the Australian flora, it is to be admitted, that some of them in all probability occur already in the collections of Allan Cunningham, of R. Brown, or even of Banks and Solander, still unrevealed to botanical science.

The number of plants observed in the whole extent of our journey amounts to nearly 2000 species, which exhibit the proportionately great number of 160 natural orders, and more than 800 genera. Monocotyledoneæ bear to Dicotyledonous plants scarcely the proportion of 1 : 4, and Acotyledoneæ (exclusive of minute fungi) 1 : 8, but with the omission of Algæ only 1 : 12. In North, North-western, and Central Australia cryptogamic plants diminish in number with the decrease of atmospherical humidity to such an extent, that their relative proportions to the rest of the vegetation is probably much smaller than in any other part of the globe, mosses and lichens being almost entirely excluded from many extensive tracts of the country.

The richest natural orders of plants observed in tropical Australia may be arranged according to the preponderance of species in the following series: viz. *Leguminosæ*, *Myrtaceæ*, *Compositæ*, *Cyperoideæ*, *Algæ*, *Euphorbiaceæ*, *Rubiaceæ*, *Filices*, *Proteaceæ*, *Malvaceæ*, *Goodeniaceæ*, *Solanaceæ*, *Convolvulaceæ*, *Sapindaceæ*, *Scrophularinæ*, &c. But this series, applying to the accumulation of plants from all the country traversed, has to receive considerable alteration in adapting it exclusively to the north-west portion of the continent, where *Compositæ*, *Euphorbiaceæ*, *Rubiaceæ*, and *Filices* exist only in a much diminished proportion.

The expedition has not disclosed a single new fundamental form of the vegetable kingdom in the type of a new natural order, unless such should be exhibited yet by any of those, which were seen in a state too imperfect for accurate classification, and were consequently excluded from the appended systematical list. But *Hippocrateæ*, *Alangiaceæ*, *Hydrophyllæ*, *Ephedreæ*, and *Pontederiaceæ* are now for the first time introduced into the Australian flora. The genera, richest of all, are to be arrayed according to their predominance in the following succession:—*Acacia*, *Eucalyptus*, *Solanum*, *Panicum*, *Fimbristylis*, *Grevillea*, *Goodenia*, *Hibiscus*, *Ipomœa*, *Stylidium*, *Mitrasacme*, *Andropogon*, *Cyperus*, *Sida*, *Crotalaria*, *Indigofera*, *Loranthus*, *Ficus*, &c.

Of natural orders, more or less extensively represented in the extratropical parallels of Australia, none were noticed of the following beyond the tropic of Capricorn in a complex of lines of exploration exceeding 5000 miles, and in an extent of  $22^{\circ}$  of longitude and  $9^{\circ}$  of latitude; viz. *Ranunculaceæ*, *Hydrophoraceæ*, *Tremandraceæ*, *Geraniaceæ*, *Rosaceæ*, *Callitricheæ*, *Crassulaceæ*, *Cunoniaceæ*, *Mesembryanthemaceæ*, *Caprifoliaceæ*, *Epacrideæ*, *Plantagineæ*, *Irideæ*, and *Hypoxideæ*. Besides these, none of the following were noted in North or North-western Australia, viz. *Anonaceæ*, *Aurantiaceæ*, *Hippocrateæ*, *Erythroxyleæ*, *Xanthoxyleæ*, *Cedreleæ*, *Alangiaceæ*, *Escalloniaceæ*, *Araliaceæ*, *Oleaceæ*, *Piperaceæ* and *Aphyllanthaceæ*: and these are foreign to North-western Australia in addition to the former:—*Crucifereæ*, *Guttifereæ*, *Oxalideæ*, *Passifloreæ*, *Primulaceæ*, *Scitamineæ*, *Junceæ*, *Restiaceæ* and *Xerotideæ*.

Amongst the plants remarkable for their geographical distribution, the Gouty-stem tree (*Adansonia Gregorii*) is deserving of particular notice, since this expedition proved its generic identity with the Baobab or Monkey-Breadtree of Western Africa, which has hitherto remained the isolated representative of its genus. The Australian species, resembling its prototype most strikingly in the often colossal thickness of its stem and in its singular ramification, is evidently restricted to the north-western part of this continent, where Allan Cunningham assigned to it a range of  $4^{\circ}$  of longitude, and where the same extent of latitude limits its existence. The fruits, borne on a short stalk, contain a dry acidulous pulp, similar to that of *Adansonia digitata*.

Of two endemic kinds of *Cochlospermum* (Silk-cotton trees), one was found to be a native only of North-western Australia, whilst the other extended from around the Gulf of Carpentaria as far as Porter's Range on the Burdekin. A species of *Datura* (allied to *D. alba* of East India) is truly indigenous in the eastern interior: a *Calamus* ranges as far south as Moreton Bay; a second species of the New Zealandian genus *Teucrium* occurs in the hotter parts of Eastern Australia; an undescribed *Gossypium* (mentioned already by A. Cunningham) is dispersed throughout the tropics of this country; a third species of *Pandanus* indicates generally the permanency of fresh water; and the only indigenous *Sciadophyllum* seems to be analogous with *Sc. macrostachyum* of New Guinea, and occurs, according to the observations of Mr. C. Moore, as far south as Wide Bay. I may also draw attention to the wide northern range of the following genera, known formerly only from the extratropical zone of Australia; viz. *Seringia*, *Ke-*

*raudrenia*, *Rulingia*, *Oxylobium*, *Gompholobium*, *Lhotskya*, *Tryptomene*, *Astartea*, *Harmogia*, *Therogeron*, *Cyclothea*, *Eremophila*, *Pholidia*, *Pithyrodia*, *Halgania*, and *Cladium*. Not less than sixty genera were observed during the progress of the expedition, which, although established in the floras of other countries, remained unnoticed by any writer on Australian botany: viz. *Stephania*, *Abelmoschus*, *Adansonia*, *Helicteres*, *Melochia*, *Riedleya*, *Melhania*, *Ximenia*, *Glycosmis*, *Hippocratea*, *Bergia*, *Nephelium*, *Cardiospermum*, *Azadirachta*, *Westonia*, *Wistaria*, *Agati*, *Æschynomene*, *Lourea*, *Dicerma*, *Taverniera*, *Atylosia*, *Rhynchosia*, *Tephrosia*, *Parinarium*, *Lumnitzera*, *Ludwigia*, *Luffa*, *Zehneria*, *Trianthema*, *Sesuvium*, *Mappa*, *Baloghia*, *Bridelia*, *Leptonema*, *Pluchea*, *Spilanthes*, *Soliva*, *Haplotaxis*, *Alstonia*, *Cerbera*, *Melodinus*, *Hydrolea*, *Bonnaya*, *Peplidium*, *Rhamphicarpa*, *Adhatoda*, *Dicliptera*, *Adenosmos*, *Teucriidium*, *Helicia*, *Ephedra*, *Ouvirandra*, *Aponogeton*, *Hydrocharis*, *Cyanotis*, *Typhonium*, *Oryza*, *Campyloneuron*, and *Ceratopteris*.

A number of genera, at least quite as large as that of the preceding series, are not referable to any hitherto described, and will prove, I trust, a valuable contribution towards the botanical system, inasmuch as the discovery of new generic types assists in disclosing the laws of affinity in nature, connecting often those forms which are isolated by wide chasms, and aiding thus in the advancement and accomplishment of a truly natural system of the whole existing vegetation.

The amount of plants added by our travels to the Australian flora approaches to 800 species. A few of them are incidentally mentioned in the works previously quoted, none however introduced by systematical descriptions. How many of these are really new to science, and how many identical with Indian or Pacific forms, can only be ascertained by a comparison of European collections, and by access to a more extensive library than I have here at my command. Still I am under the impression that at least 500 of the additional plants are peculiar to Australia, and these must therefore be considered as contributions entirely new to botany.

According to a computation instituted in 1849 by R. Brown (in the Appendix to Sturt's 'Central Australia,' ii. pp. 90, 91), the number of plants known from New Holland and Van Diemen's Land scarcely amounted to 7000. Botanical researches in West Australia, Tasmania, South Australia and the colony of Victoria,

have added since from places formerly inaccessible, exclusive of Cryptogamia, at least 1000 species.

Assuming that the increase of new Australian cryptogamic plants comprises 500 species, which cannot be considered overrated, when we remember how far alone our marine flora, through the investigations of Professor Harvey, became augmented; and if only, of those plants which resulted from the North Australian expedition, 500, as mentioned before, are regarded as wanting in the existing former collections;—I believe we may then safely assume, that we are at present more or less acquainted with 9000 Australian plants.

The scantiness of the vegetation observed by Capt. Sturt and by us towards Central Australia; the very limited number of new plants contained in a considerable collection formed by Mr. Wilhelmi, west of Spencer's Gulf; the extensive range of identical species along the tropical east coast, and your own observations on the decrease of plants towards the interior of Western Australia;—are sufficient reasons to anticipate, that botanical travellers in future will add scarcely 1000 truly distinct plants to those hitherto accumulated, and that, consequently (with the omission of minute fungi), the vegetable empire of all Australia, inclusive of Tasmania, does in all probability not comprise above 10,000 species.

Many of the indigenous vegetable productions proved eminently useful to the expedition; still it cannot be denied that their number, as far as ascertained, remains exceedingly limited, compared with the total of the plants observed; and attention has already been directed to most of them by Dr. Leichhardt; but in consequence of an extensive loss of specimens, he was deprived of the opportunity of determining many of those useful plants with botanical accuracy; and I shall therefore offer our own observations.

*Nymphæa gigantea* and a second species, both allied to the sacred Lotus of the ancient Egyptians (*Nymphæa lotus*), adorn in a variable shade of colours everywhere the waters of the warmer zone of Australia. The seed-vessels and the roots of these water-lilies form a large proportion of the vegetable food of the northern natives, and the former particularly will always be regarded as a providential gift in cases of need, by explorers of the North Australian wilderness. Yet more valuable, but less frequent, is *Nelumbium speciosum*, which reaches to East Australian extra-tropical latitudes. Being identical with the well-known Pytha-

gorean Bean, it is needless to repeat here the uses of a plant which has been famous since the remotest antiquity. During the greater part of the journey, we were more or less extensively supplied with indigenous fruits. Thus the acidulous drupes of three Meliaceous trees (belonging to a new genus of the Trichilious section), the Nonda fruit of Dr. Leichhardt (now referred to *Parinarium*, and also observed on the islands of Torres Strait), a small kind of cucumber, a species of rose-apple (*Jambosa eucalyptoides*), the fruit of *Mimusops Kauki* (a plant restricted to the north-east coast), that of a broad-leaved species of *Terminalia*, the berries of *Phyllis parviflora*, the small Lemon of the Brigalow Scrub (*Triphasia glauca*), the berries of Leichhardt's bread-tree (*Gardenia edulis*);—all these were periodically enjoyed, and added often to our diet those vegetable components so essentially required in the torrid zone. In this regard, we had almost daily occasion to praise the value of the purslane (*Portulaca oleracea*), which not only occurred in every part of the country explored, but also—principally in the neighbourhood of rivers—often in the greatest abundance. We found it, in sandy and grassy localities, so agreeably acidulous, as to use it for food without any preparation; and I have reason to attribute the continuance of our health, partially to the constant use of this valuable plant. The absence of other antiscorbutic herbs in the north, and the facility with which it may be gathered, entitle it to particular notice.

The Australian spinach (*Chenopodium erosum*), the New Zealandian (*Tetragonia expansa*), and the watercresses (*Nasturtium terrestre* and *Cardamine hirsuta*), which are in utility equal to the purslane, are almost confined to East Australia.

The clustered fig, the produce of a seemingly undescribed arborescent *Ficus*, proved second in importance only to the *Portulaca*, but was rarely available, except along the rivers of East and North-east Australia; and the native Mulberry (*Morus Calceagalli*) was nowhere noticed except on the subtropical portion of the east coast. The tender parts of the stem, and the base of the leaves of *Cymbidium canaliculatum*, the only orchid of the interior of tropical Australia, afforded a mucilaginous food; and the foliage of a *Hibiscus*, closely allied to *H. heterophyllus*, served as a substitute for sorrel. The gum of the *Terminalias*, *Sterculias*, and *Acacias* was seldom obtained, perhaps only in consequence of a season unfavourable for its exudation.

*Livistonia inermis* and an allied species supplied us occasionally with palm-cabbage; a similar substance, yielded by the Screw-

pinus (*Pandanus spiralis* and *P. aquaticus*) seemed to be quite harmless, although it retained, even after boiling, some acidity.

In addition to these, there remain to be mentioned, the "MacKenzie Bean" (*Canavallia Baueriana*), the yam (*Dioscorea*), the tubers of *Aponogeton* and *Ouvirandra*, which are of a most agreeable taste, and the root of *Typha*. But the *Tacca*-tubers are only useful in the preparation of starch.

The plan of the expedition, according to which such an extensive part of the country was to be explored within a limited period, scarcely admitted of an inquiry into the qualities of the timber or into the medicinal or economical properties of the plants we met with, even in those cases where they were expected to exist.

With regard to the former, we regretted to observe in the northern and north-western portion of the continent almost generally the want of that size and regularity of growth for which many of the common trees are so much valued in the colonized parts of Australia. *Melaleuca Leucadendron* (the Indian Cajuput tree) forms the largest and straightest timber tree in the north. Pines were, with the exception of a solitary *Callitris*, nowhere observed except towards the east coast, and *Casuarinas* are wanting in the vicinity of the Victoria River; whilst our only northern species of this genus (*C. equisetifolia*), a timber-tree of the South-Sea Islands and of the coast tracts of India and Africa, was of universal occurrence around the Gulf of Carpentaria and on the east coast. The stately *Casuarina Decaisneana* we discovered in the sandy desert of Central Australia.

Of *Eucalyptus* occurred not less than 40 species. Two of these retain a scrubby habit and belong exclusively to the inland desert. Of the other species, the Flooded Gum-tree (*E. rostrata*, Schl., *E. acuminata*, Hook.), which is identical with the Yarra-tree of Sir T. Mitchell, and with the red Gum-tree of the South Australian colonists, was found to be universally distributed over the country. Its timber is well known for its durability and being capable of receiving a beautiful polish. Many of the Gum-trees are in their distribution limited by the dividing ranges, but that species named by the colonists "Moreton Bay Ash," advances to the south-east part of the Gulf of Carpentaria, whilst the so-called "Iron-bark tree," when suddenly appearing with the fall of the eastern waters, becomes at once a universal timber-tree.

Mr. C. Moore, who demonstrated the utility and unusual variety of the timber of East Australia so well in the Paris Exhibition, informs us that it is not *Oxleya xanthoxyla*, which supplies the



kind of yellow wood, which attained some celebrity in New South Wales. According to an examination of the fruit, it is yielded by a second species of *Azadirachta*. The only indigenous *Erythroxyton*, a small tree not uncommon in East Australia, produces in all probability a red dye similar to that of its congeners.

With regard to the medical properties of the plants, observed during the expedition, I may allude to the tonic bitterness of several *Goodeniaceæ*, of *Canscora diffusa* (which is identical with *Orthostemon erectus*, R. Br.), and of a new genus of *Simarubææ* (*Picroxyton*), with a wood similar to that of *Quassia*. The *Eucalyptus kino* might be procured in boundless quantities. The bark of the Red Cedar-tree (*Cedrela Australis*) seems to offer a good substitute for that of *Cedrela Toona* and *C. febrifuga*.

The occurrence of some virulent vegetable poison in North-west Australia manifested itself by the loss of several of our horses on three occasions, and I deplore that I failed to ascertain the plant which caused this calamity. In its effects this poison is even more active than that of *Gastrolobium* and *Gompholobium*, which are so destructive to the herds of Western Australia, and its action on the stomach of the animals inflammatory in a high degree. These losses happened on the rocky edges of the sandstone tableland near rivulets lined with *Pandanus spiralis*; but I searched in vain in these localities for plants, the natural alliance of which would justify any suspicion.

My previous remark on the preponderance of grasses, does not merely allude to their diversity in species, but applies equally to their gregarious distribution over a great part of the country. Numerous species of *Panicum* and *Andropogon*, several of *Anthistiria*, *Poa*, *Sporobolus*, *Ectrosia*, *Eriachne*, *Saccharum*, and *Rottboellia*, a *Paspalum*, a *Dactyloctenium*, a kind of rice, and many other grasses of equal value for pasture, cover either the basaltic plains, the valleys, or the fertile undulations. An *Ischæmum*-reed of vast abundance on the banks of the Victoria River offered additional food for our horses. But all the extensive sandstone elevations are devoid of nutritious forage, and the harsh or rigid forms of *Triodia*, *Aristida*, and *Triraphis* supersede the tender grasses of the lower ground.

The rainy season, which we observed to last from November till January, renews with a wonderful rapidity the grasses and the herbaceous vegetation at the hottest season. To this circumstance we have principally to ascribe the continuance of grass in a nutritious state throughout a longer period of the year than in

many of the southern tracts of Australia. Dew and occasional showers of rain renew, even to some extent, the grasses in the cooler season, more particularly in localities denuded by bush-fires.

It would lead beyond the limits of this document to contemplate the botany of the country in its full details, but I may sketch the principal distinctive features of the vegetation, which in a comprehensive view can be divided into the following groups:—

1. Plants of the dense coast-forests.
2. „ of the Brigalow scrub.
3. „ of the open downs.
4. „ of the desert.
5. „ of the sandstone table-land.
6. „ of the sea-coast.
7. „ of the banks and valleys of rivers.

The first division, designated by the colonists the brushwood or cedar country, is characterized prominently by a great variety of umbrageous trees, chiefly of an Indian type. These forests occupy the slopes of ranges fronting the east coast, and seem to be dependent, not only on climate, but also, at least in some degree, on the decomposition of schistaceous rocks. The monotony of *Eucalyptus* here gives way to trees of the meliaceous, cedrelaceous, sapindaceous, euphorbiaceous, celastrinaceous, rubiaceous, and laurineous orders, intermixed with *Acronychia*, *Castanospermum*, *Erythrina*, *Ficus*, *Eupomatia*, and trees of other genera, often interrupted by a vast prevalence of noble Araucarias, matted together into an impervious thicket by *lianes* of *Calamus*, of asclepiadeous, apocynaceous, convolvulaceous, menispermaceous, and ampelideous plants, and harbouring in their shade numerous parasitical orchids and ferns.

2. The Brigalow scrub, peculiar apparently to a rather argillaceous sandstone, stretches in East Australia over the elevated plains west of the coast range as far north as Newcastle range; and some of its plants transgress even the elevations which separate the waters of the east coast from those of the Gulf of Carpentaria. Its plants are varied in the extreme; typical of it are, however, shrubs or small trees of *Capparis*, *Pittosporum*, *Heterodendron*, *Triphasia glauca*, *Geijera*, *Brachychiton*, *Cassia*, *Acacia*, *Myoporum*, *Canthium*, *Ehretia*, *Bauhinia Hookeri* and *Bauhinia Carroni*, *Anthobolus leptomerioides*, *Delabechea rupestris*, and principally *Eremophila Mitchelli* and *Strzeleckia dissosperma*. *Eucalypti*, often of considerable size, are dispersed through the Brigalow scrub. In a modification of this botanical feature of the country,

distinguished as the Bottletree scrub, *Delabechea*, *Bauhinia* and *Brachychiton* prevail, seemingly ruled by the presence of basalt, conglomerate, or lime.

3. The open downs of basaltic origin are in many instances surrounded by the Brigalow, or are bordered by the desert. Except along the watercourses, they are nearly destitute of trees, and for the greater part of the year utterly devoid of water. The rich soil readily absorbs the rain, and produces thus a luxuriant herbaceous vegetation. Grasses are here, as stated before, abundant, and cannot in their pastoral value be surpassed. Plants of the genera *Abelmoschus*, *Hibiscus*, *Sida*, *Crotalaria*, *Sesbania*, *Neptunia*, *Cucumis*, *Wedelia*, *Wollastonia*, *Spilanthus*, *Glossogyne*, *Portulaca*, *Gomphrena*, *Pimelea*, *Commelyna*, *Cæsia*, *Bulbine*, &c. are conspicuous, and a marked increase of *Compositæ* is perceptible in those parts of this formation nearest to the eastern coast, where also the occurrence of a new *Verbena* suggested the appellation "Vervain plains" for a certain tract of this country.

4. The desert is, according to the varied character of its sandy, saline, or argillaceous soil, extremely changeable in its flora; but the generality of its plants agrees so well with the genera, and even species, of the barren tracts of the south, as to render their explication here unnecessary. *Trianthema*, *Newcastelia*, *Microcassia*, *Gomphrena*, *Ptilotus*, and a few other desert plants seem not to spread far southward. *Acacia* forests cover the rising ground.

5. The sandstone table-land forms in its endless extent a landscape equally arid and cheerless. *Eucalypti*, often diminutive, some with lamellar bark and brilliant orange and scarlet flowers, a dwarf *Thouinia*, some *Hibisci*, *Brachychiton ramiflorum*, *Cochlospermum*, *Dodonæa*, *Distichostemon*, *Corchorus*, *Owenia*, *Boronia*, *Zizyphus*, *Buchanania*, *Terminalia*, *Jacksonia*, *Oxycladium*, *Nematophyllum*, *Bossia*, *Indigofera*, *Psoralea*, *Zornia*, *Atylosia*, *Erythrina Vespertilio*, *Bauhinia Leichardtii*, *Labouchea* (the leguminous Iron-bark tree of Dr. Leichhardt), numerous *Acacias*, various species of *Calycothrix* and *Melaleuca*, *Lhotzkya cuspidata*, *Verticordia Cunninghami*, *Xanthostemon paradoxus*, *Gardenia*, *Petalostigma*, *Scævola*, *Goodenia*, *Sersalisia*, *Strychnos*, *Spathodea*, many species of *Heliotropium*, *Balfouria saligna*, *Gyrocarpus sphenopterus*, *Persoonia falcata*, *Hakea arborescens*, a considerable number of *Grevilleas*, and *Santalum lanceolatum* constitute, with the above-mentioned *Aristida*, *Triodia* and *Triraphis*, its principal vegetation, *Livistona inermis* gracing now and then its declivities.

6. For the characteristics of the sea-coast we have principally to

refer to the mangrove plants with their usual companions, viz. *Ceriops*, *Rhizophora*, *Bruguiera*, *Avicennia*, *Suriana*, *Ægiceras*, *Ægialitis*, *Pemphis*, &c. On the sandy coast, *Colubrina asiatica*, *Pandanus*, *Spinifex fragilis*, *Triumfetta procumbens*, *Tribulus*, &c., are conspicuous.

7. The following plants are, along the banks of the northern rivers, of frequent occurrence:—the broad-leaved *Terminalia Chuncoa* (the raspberry-tree of Leichhardt), *Jambosa eucalyptoides*, *Morinda Leichhardtii*, *Inga moniliformis*, *Warringtonia*, *Agati*, *Polygonum Cunninghami* (which surrounds also frequently the lagoons of the interior), *Pandanus*, *Melaleuca Leucadendron*, *Eucalyptus rostrata*, &c., whilst the vegetation of the grassy valleys bears a resemblance to that of the basaltic downs.

Several other localities with a vegetation of their own, but of less extent or not sufficiently known, cannot be noted on this occasion. Thus the porphyritic ranges which separate the rivers of the Gulf of Carpentaria from those of the eastern coast, the granitic valley of the Nicholson, and other places, are productive of plants which rely upon peculiar geological structures.

I beg to transmit with this report the remaining number of systematical descriptions of new or rare plants, drawn up almost exclusively on the spots of discovery, and which illustrate, with the addition of those forwarded on the former occasions, nearly 600 species; but I have to regret, that in consequence of the destruction of part of the botanical collections on board of the "Messenger," I am not enabled to accompany, in a few instances, these manuscripts with corresponding specimens.

I beg also to append to this communication two lists of plants. In the first I have endeavoured to determine the northern limits of 243 species from the more southern latitudes of Australia, which gradually appeared on the lines of exploration from lat. 17° 30' south, to lat. 27° south. Probably a slight variation in their range will be observed hereafter under other meridians: still I believe that the limits assigned to them will be found approximately correct for the eastern part of the country within a moderate distance from the coast. The second Appendix contains a systematical catalogue of nearly all the genera of plants observed during the journey, with their respective number of species; and this may serve as an outline of the tropical vegetation of Australia.

In conclusion, I perform a pleasing duty in acknowledging most thankfully the ample opportunities offered by yourself for the

prosecution of my labours, which I found facilitated to the fullest extent, as far as circumstances would permit.

I have also to acknowledge contributions towards the botanical collections from all the officers of the expedition, and although those additions yielded but a very small number of species not observed by myself, yet I was thus enabled to reexamine many plants in a more perfect state of development.

I am placed under the greatest obligation to Mr. Walter Hill, Curator of the Brisbane Botanic Garden, not only for communicating some valuable and unique specimens, but also for his disinterestedness in assisting me with his local knowledge of the Moreton Bay district, in obtaining many botanical rarities which I otherwise should have failed to procure; and it remains for me to express likewise my thanks to Mr. C. Moore, Director of the Botanic Garden at Sydney, for providing me with ample room for arranging the herbarium, for giving me unlimited access both to the library and the collections of his establishment, and for rendering numerous services to alleviate my labours in Sydney.

To his Excellency the Governor-General I owe the deepest gratitude for entrusting to me the phytological investigation of such an ample and interesting tract of country, a favour, which I can—reflecting on the rarity of such occasions for research—never sufficiently acknowledge; and finally, I feel proud to state, that, through the usual liberality of Sir William Hooker, I am permitted by Her Majesty's Government to retain a set of botanical specimens, in order to elucidate hereafter to the fullest extent the flora of tropical Australia.

I have the honour to be, Sir,

Your most obedient and humble servant,

FERDINAND MULLER,

Botanist to the North-Australian Expedition.

## APPENDIX I.

*Showing the range of Extratropical Australian Plants towards the North, as observed during the North-Australian Expedition.*

*From lat. 17° 30' to 18° 30' south.*

*Polygonum plebeium, R. Br.*

*Solanum verbascifolium, L.*

—— *nigrum, L.*

*Teucrium argutum, R. Br.*

*Eremophila Mitchelli, Benth.*

*From lat. 18° 30' to 19° south.*

*Chenopodium erosum, R. Br.*

*Bauhinia Hookeri, Ferd. Mull.*

*Vittadinia cuneata, D.C.*

*Plectranthus parviflorus, W.*

*Ruellia Australis, R. Br.*

*Eranthemum variabile*, R. Br.  
*Helichrysum lanuginosum*, A. Cunn.  
*Oxalis corniculata*, L.  
*Hydrocotyle asiatica*, L.  
*Calotis scapigera*, Hook.  
 ——— dilatata, A. Cunn.  
*Verbena officinalis*, L.  
*Strzeleckia dissosperma*, F. Muller.

From lat. 19° to 20° south.

*Geijera latifolia*, Lindl.  
*Nasturtium terrestre*, R. Br.  
*Xerotis longifolia*, R. Br.  
*Rytidochlamys Mitchelli*, Sond.  
*Rumex Brownii*, Campd.  
*Siegesbeckia orientalis*, L.  
*Juncus pallidus*, R. Br.  
*Usnea barbata*, Ach.  
*Alyxia ruscifolia*, R. Br.  
*Lythrum Hyssopifolium*, L.  
*Convolvulus erubescens*, Sims.  
*Polygonum lapathifolium*, H. Kew.  
*Gnaphalium involucratum*, Forst.  
*Eclipta erecta*, L.  
*Heterodendron oleifolium*, Desf.  
*Azolla pinnata*, R. Br.

From lat. 20° to 21° south.

*Canthium oleifolium*, Hook.  
*Scævola spinescens*, R. Br.  
*Dipodium punctatum*, R. Br.  
*Goodenia geniculata*, R. Br.  
*Anthobolus leptomeroides*, n. sp.

From lat. 21° to 22° south.

*Vellea macrocalyx*, Vriese.  
*Goodenia hederacea*, R. Br.  
*Myoporum dulce*, Bth.  
*Senecio rupicola*, Less. & Rich.  
*Pholidia polyclada*, Ferd. Muller.  
*Triphasia glauca*, Lindl.  
*Cassia circinata*, Bth.  
 ——— canaliculata, R. Br.

From lat. 22° to 23° south.

*Pomax Solandri*, Ferd. Muller.  
*Tricoryne scabra*, R. Br.

*Erechthites*, sp.  
*Daucus brachiatus*, Sieb.  
*Calotis microcephala*, Bth.  
*Abutilon diplotrichum*, F. Muller.  
*Ajuga Australis*, R. Br.  
*Acacia juniperina*, W.  
*Blitum glandulosum*, Moqu.  
*Picris angustifolia*, D. C.  
*Cassia platypoda*, R. Br.

From lat. 23° to 24° south.

*Bulbine bulbosa*, R. & S.  
*Indigofera brevidens*, W.  
*Scævola microcarpa*, Cuv.  
*Swainsonia coronillifolia*, Salisb.  
*Hypoxis hygrometrica*, Labill.  
*Psoralea tenax*, Lindl.  
*Pycnosorus globosus*, Bth.  
*Thysanotus tuberosus*, R. Br.  
*Aneilema graminea*, R. Br.  
*Pratia Cunninghami*, Hook. fil.  
*Mimulus gracilis*, R. Br.  
*Tetragonia expansa*, L. fil.  
*Zygophyllum apiculatum*, F. Mull.  
*Atriplex semibaccata*, R. Br.  
*Lespedeza juncea*, Pers.  
*Andropogon Sieberi*, Kunth.  
*Asperula divaricata*, Bisch.  
*Pimelea microcephala*, R. Br.  
*Stackhousia asperococca*, Salisb.  
*Polygonum prostratum*, R. Br.  
*Cuscuta Australis*, R. Br.  
*Brachycome graminea*, F. Muller.  
*Carex inversa*, R. Br.  
*Cyperus enervis*, R. Br.

From lat. 24° to 25° south.

*Funaria hygrometrica*, Hedw.  
*Brachychiton populneum*, R. Br.  
*Cassia vittata*, R. Br.  
*Rubus macropodus*, Séringe.  
*Xanthorrhœa arborea*, Sm.  
*Macrozamia spiralis*, Miqu.  
*Adiantum Æthiopicum*, W.  
 ——— hispidulum, Sm.  
*Poranthera microphylla*, Brongn.

*Pimelea glauca*, *R. Br.*  
*Velleya paradoxa*, *R. Br.*  
*Hydrocotyle densiflora*, *D.C.*  
*Thesium Australe*, *R. Br.*  
*Exocarpus cupressiformis*, *Labill.*  
*Leuzea Australis*, *D.C.*  
*Helipterum punctatum*, *D.C.*  
*Cassytha paniculata*, *R. Br.*  
*Scirpus maritimus*, *L.*  
 ——— *lacustris*, *L.*  
*Ranunculus lappaceus*, *Sm.*  
*Cynoglossum Australe*, *R. Br.*  
*Dichondra repens*, *R. Br.*

*From lat. 25° to 26° south.*

*Plantago debilis*, *R. Br.*  
*Angophora eucalyptoides*, *F. Mull.*  
*Scirpus mucronatus*, *L.*  
*Calotis dentex*, *R. Br.*  
*Pultenæa retusa*, *Sm.*  
*Mentha saturejoides*, *R. Br.*  
*Veronica calycina*, *R. Br.*  
*Sambucus Gaudichaudiana*, *D.C.*  
*Polygonum gracile*, *R. Br.*  
*Cyperus venustus*, *R. Br.*  
*Clematis glycinoides*, *D.C.*  
*Solanum aviculare*, *Forster.*

*From lat. 26° to 27° south.*

*Juncus prismatocarpus*, *R. Br.*  
*Goodenia bellidifolia*, *Sm.*  
 ——— *paniculata*, *Sm.*  
*Opercularia varia*, *Hook.*  
*Pimelea gracilis*, *R. Br.*  
*Brasenia peltata*, *Pursh.*  
*Potamogeton obtusifolius*, *Mert. & Koch.*  
*Brunonia sericea*, *Sm.*  
*Gratiola pedunculata*, *R. Br.*  
*Viola betonicifolia*, *Sm.*  
*Daviesia ulicina*, *Sm.*  
 ——— *ruscifolia*, *A. Cunn.*  
*Lepidium hyssopifolium*, *Desf.*  
*Stylidium graminifolium*, *Sm.*  
*Beyera oblongifolia*, *Kl.*  
*Carex appressa*, *R. Br.*

*Morinda jasminoides*, *A. Cunn.*  
*Polygala veronica*, *Ferd. Muller.*  
*Microtis parviflora*, *R. Br.*  
*Cladium junceum*, *R. Br.*  
*Cynogeton Huegelii*, *Endl.*  
*Cinna ovata*, *Kunth.*  
*Harmogia virgata*, *Schauer.*  
*Pteris esculenta*, *Forst.*  
*Platyserium alaicorne*, *Desv.*  
*Davallia pyxidata*, *Sm.*  
*Cynoglossum latifolium*, *R. Br.*  
*Rubus rosæfolius*, *L.*  
*Caustis pentandra*, *R. Br.*  
*Carex longifolia*, *R. Br.*  
 ——— *littorea*, *Labill.*  
*Lycopus Australis*, *R. Br.*  
*Viola hederacea*, *Labill.*  
*Lepidosperma exaltatum et laterale*, *R. Br.*  
*Juncus vaginatus*, *R. Br.*  
 ——— *maritimus*, *Lam.*  
*Polygonum strigosum*, *R. Br.*  
*Festuca littoralis*, *Labill.*  
*Microlæna stipoides*, *R. Br.*  
*Billardiera scandens*, *Sm.*  
*Jonidium filiforme*, *D.C.*  
*Drosera binata*, *Labill.*  
 ——— *peltata*, *Sm.*  
*Comesperma acutifolium*, *Steetz.*  
 ——— *retusum*, *Labill.*  
*Tetratheca ciliata*, *Labill.*  
*Polycarpon alsinifolium*, *D.C.*  
*Commersonia Fraseri*, *Gay.*  
*Geranium pilosum*, *Forst.*  
*Erodium cygnorum*, *Nees.*  
*Phyllota squarrosa*, *Bth.*  
*Aotus villosa*, *Sm.*  
*Dillwynia ericifolia*, *Sm.*  
*Pultenæa villosa*, *Sm.*  
 ——— *retusa*, *Sm.*  
*Hovea linearis*, *R. Br.*  
*Platylobium formosum*, *Sm.*  
*Bossia ensata*, *Sieb.*  
*Kennedya splendens*, *Paxt.*  
*Hardenborgia monophylla*, *Bth.*  
*Acacia suaveolens*, *W.*

- Acacia Sophoræ*, *R. Br.*  
*Epilobium Billardieri*, *Sér.*  
*Tillæa verticillaris*, *D.C.*  
*Callicoma serratifolia*, *R. Br.*  
*Mesembryanthemum æquilaterale*,  
*Haw.*  
*Actinotus Helianthi*, *Labill.*  
*Trachymene ovata*, *D.C.*  
*Petroselinum prostratum*, *D.C.*  
*Astrotricha longifolia*, *Bth.*  
*Sambucus xanthocarpa*, *F. Muller.*  
*Ricinocarpus pinifolius*, *Desf.*  
*Solenogyne bellioides*, *Cass.*  
*Lobelia anceps*, *Thunb.*  
—— *gibbosa*, *Labill.*  
—— *pedunculata*, *R. Br.*  
*Scævola suaveolens*, *R. Br.*  
*Styphelia viridiflora*, *R. Br.*  
*Lissanthe daphnoides*, *R. Br.*  
*Leucopogon Richei*, *R. Br.*  
—— *affinis*, *R. Br.*  
—— *juniperinus*, *R. Br.*  
—— *ericoides*, *R. Br.*  
*Monotoca elliptica*, *R. Br.*  
*Epacris pulchella*, *R. Br.*  
—— *obtusifolia*, *Sm.*  
—— *purpurascens*, *R. Br.*  
*Ponceletia sprengelioides*, *R. Br.*
- Melichrus*, *sp.*  
*Trochocarpa laurina*, *R. Br.*  
*Myrsine variabilis*, *R. Br.*  
*Villarsia parnassifolia*, *Labill.*  
*Calystegia marginata*, *R. Br.*  
*Prostanthera linearis*, *R. Br.*  
*Conospernum taxifolium*, *Sm.*  
*Persoonia tenuifolia*, *R. Br.*  
—— *virgata*, *R. Br.*  
—— *lanceolata*, *Sm.*  
*Banksia latifolia*, *R. Br.*  
—— *oblongifolia*, *Cav.*  
—— *serrata*, *L. Suppl.*  
—— *integrifolia*, *L. Suppl.*  
*Leptomeria acida*, *R. Br.*  
*Casuarina tenuissima*, *Sieb.*  
*Cryptostylis longifolia*, *R. Br.*  
*Spiranthes Australis*, *Labill.*  
*Pterostylis ophioglossa*, *mutica*, *et*  
*concinna*, *R. Br.*  
*Acianthus fornicatus*, *R. Br.*  
*Corysanthes unguiculata*, *R. Br.*  
*Chiloglottis diphylla*, *R. Br.*  
*Cyrtostylis reniformis*, *R. Br.*  
*Glossodia minor*, *R. Br.*  
*Sowerbæa juncea*, *Sm.*  
—— *sericea*, *Sm.*

## APPENDIX II.

*Systematic Index of the Genera of Plants observed during Mr. Gregory's Expedition in tropical and Eastern subtropical Australia; with the addition of the approximate number of Species either noticed or collected by Dr. Ferd. Müller, Botanist to the Expedition.*

## THALAMIFLOREÆ.

<i>Ranunculaceæ.</i>	SP.	<i>Anonaceæ.</i>	SP.
<i>Ranunculus</i> .....	2	<i>Eupomatia</i> .....	1
<i>Clematis</i> .....	1— 3		
		<i>Menispermæ.</i>	
<i>Dilleniaceæ.</i>		<i>Cocculus</i> .....	3
<i>Hibbertia</i> .....	8	<i>Stephania</i> .....	1— 4
<i>Pleurandra</i> .....	2		
<i>Hemistemma</i> .....	3	<i>Nymphaeaceæ.</i>	
<i>Pachynema</i> .....	1— 14	<i>Nymphaea</i> .....	2



## THALAMIFLORÆ (continued).

<i>Nelumbineæ.</i>		SP.	<i>Malvaceæ.</i>		SP.
Nelumbium .....		1	Malva .....		2
<i>Cabombeæ.</i>			Sida .....		13
Brasenia .....		1	Abutilon .....		8
<i>Cruciferaæ.</i>			Pavonia .....		1
Cardamine .....		1	Abelmoschus .....		2
Nasturtium .....		1	Hibiscus .....		17
Lepidium .....		1— 3	Gossypium .....		1— 44
<i>Capparideæ.</i>			<i>Bombaceæ.</i>		
Capparis .....		8	Adansonia .....		1
Cleome .....		3	Methorium .....		3
Rœpera .....		1— 12	Helicteres .....		1
<i>Violarinæ.</i>			Sterculia .....		1
Ionidium .....		3	Delabechea .....		1
Viola .....		2— 5	Brachychiton .....		4— 11
<i>Droseraceæ.</i>			<i>Cochlospermeæ.</i>		
Drosera .....		6	Cochlospermum .....		2
Byblis .....		1— 7	<i>Tiliaceæ.</i>		
<i>Polygaleæ.</i>			Grewia .....		3
Polygala .....		4	Triumfetta .....		6
Comesperma .....		4— 8	Corchorus .....		6— 15
<i>Tremandreeæ.</i>			<i>Buttneriaceæ.</i>		
Tetrathea .....		1	Seringia .....		1
<i>Pittosporææ.</i>			Keraudrenia .....		2
Pittosporum .....		5	Rulingia .....		2
Billardiera .....		1	Commersonia .....		1
Ixiosporum .....		1	Dicarpidium .....		1
Hymenosporum .....		1	Waltheria .....		1
Citriobatus .....		1	Melochia .....		1
Bursaria .....		1— 10	Riedleja .....		1
<i>Frankeniaceæ.</i>			Melhania .....		1— 11
Frankenia .....		1	<i>Elæocarpeæ.</i>		
<i>Caryophylleæ.</i>			Elæocarpus .....		2
Polycarpæa .....		5	<i>Olacinæ.</i>		
Polycarpon .....		1— 6	Ximenia .....		1
<i>Surianeæ.</i>			Olax .....		2— 3
Suriana .....		1	<i>Aurantiaceæ.</i>		
<i>Phytolacceæ.</i>			Triphasia .....		1
*Phytolacca .....		1	Glycosmis .....		1
Cyclothea .....		1— 2	Limonia .....		1— 3
			<i>Hypericinæ.</i>		
			Hypericum .....		1

## THALAMIFLORÆ (continued).

<i>Elatineæ.</i>	SP.	<i>Ampelideæ.</i>	SP.
Elatine .....	1	Cissus .....	9— 9
Bergia .....	3— 4	<i>Geraniaceæ.</i>	
<i>Guttiferaæ.</i>		Geranium .....	1
Calophyllum .....	1	Erodium .....	1— 2
<i>Hippocrateæ.</i>		<i>Oxalideæ.</i>	
Hippocratea .....	1	Oxalis .....	1
<i>Erythroxyleæ.</i>		<i>Zygophylleæ.</i>	
Erythroxylon .....	1	Zygophyllum .....	1
<i>Sapindaceæ.</i>		Tribulopsis .....	3
Dodonæa .....	9	Tribulus .....	3— 7
Distichostemon .....	1	<i>Rutaceæ.</i>	
Heterodendron .....	2	Geijera .....	3
Nephelium .....	5	Euodia .....	1
Cupania .....	5	Eriostemon .....	2
Thouinia .....	2	Zieria .....	1
Schmiedelia .....	1	Boronia .....	8— 15
Cardiospermum .....	1	<i>Xanthoxyleæ.</i>	
Apophyllum .....	1— 27	Acronychia .....	3
<i>Meliaceæ.</i>		<i>Simarubeæ.</i>	
Elseya .....	1	Picroxylon .....	1
Azadirachta .....	1	<i>Cedreleæ.</i>	
Owenia .....	5	Flindersia .....	1
Hartighsea .....	3	Strzeleckia .....	1
Melia .....	1	Oxleya .....	1
Carapa .....	1— 12	Cedrela .....	1— 4

## CALYCIFLORÆ.

<i>Stackhousiæ.</i>		<i>Leguminosæ (continued).</i>	
Stackhousia .....	3	Jacksonia .....	5
<i>Celastrinæ.</i>		Oxycladium .....	1
Osteothea .....	2	Daviesia .....	2
Catha .....	4	Phyllota .....	1
Celastrus .....	2	Aotus .....	1
Elæodendron .....	1— 9	Dillwynia .....	1
<i>Rhamnææ.</i>		Euchilus .....	1
Zizyphus .....	2	Pultenæa .....	7
Colubrina .....	1	Mirbelia .....	1
Alphitonia .....	1	Hovea .....	4
Ventilago .....	1— 5	Platylobium .....	1
<i>Anacardiaceæ.</i>		Nematophyllum .....	1
Buchanania .....	1	Bossiaea .....	5
<i>Leguminosæ.</i>		Crotalaria .....	12
Oxylobium .....	2	Westonia .....	1
Podolobium .....	2	Lotus .....	1
Gompholobium .....	3		

## CALYCIFLORÆ (continued).

<i>Leguminosæ</i> (continued).	SP.	<i>Rosaceæ.</i>	SP.
Indigofera .....	12	Rubus .....	3
Psoralea .....	8		
Psoralina .....	3	<i>Chrysobalanææ.</i>	
Tephrosia .....	6	Parinarium .....	2
Wistaria .....	2		
Sesbania .....	4	<i>Combretaceæ.</i>	
Agati .....	1	Terminalia .....	9
Swainsonia .....	2	Chuncoa .....	1
Zornia .....	6	Lumnitzera .....	1— 11
Æschynomene .....	2		
Lourea .....	1	<i>Alangieæ.</i>	
Dicerma .....	1	Pseudalangium .....	1
Taverniera .....	1		
Lespedeza .....	1	<i>Melastomaceæ.</i>	
Desmodium .....	7	Melastoma .....	1
Tetracommæa .....	1	Osbeckia .....	1— 2
Kennedya .....	1		
Hardenbergia .....	1	<i>Rhizophoreæ.</i>	
Leptocyamus .....	2	Ceriops .....	1
Galactia .....	1	Rhizophora .....	1
Canavalia .....	1	Bruguiera .....	1
Mucuna .....	1	Carallia .....	1— 4
Phaseolus .....	1		
Plagiotropis .....	1	<i>Onagreæ.</i>	
Vigna .....	3	Epilobium .....	1
Erythrina .....	3	Jussiaea .....	2
Atylosia .....	3	Ludwigia .....	1— 4
Rhynchosia .....	1		
Abrus .....	1	<i>Haloragææ.</i>	
Dichromosperma .....	1	Myriophyllum .....	3
Sophora .....	1	Haloragis .....	4— 7
Castanospermum .....	1		
Barklya .....	1	<i>Callitrichinæ.</i>	
Microcassia .....	1	Callitriche .....	1
Labichea .....	1		
Petalogyne .....	2	<i>Ceratophylleæ.</i>	
Brewsteria .....	1	Ceratophyllum .....	1
Cassia .....	15		
Cæsalpinia .....	1	<i>Lythraceæ.</i>	
Bauhinia .....	3	Lythrum .....	2
Laboucheia .....	1	Calopeplis .....	1
Neptunia .....	2	Basistemon .....	1
Inga .....	1	Ammannia .....	3
Acacia .....	50—212	Pemphis .....	1— 8
		<i>Myrtaceæ.</i>	
		Calycothrix .....	7
		Lhotzkyia .....	1
		Homalocalyx .....	1
		Tryptomene .....	1
		Verticordia .....	1

## CALYCIFLORÆ (continued).

<i>Myrtaceæ</i> (continued).	SP.	<i>Escalloniæ.</i>	SP.
Darwinia .....	1	Hemidistylis .....	1
Astartea .....	1	<i>Umbelliferæ.</i>	
Harmogia .....	2	Hydrocotyle .....	7
Bæckia .....	2	Hemicarpus .....	3
Tristania .....	4	Didiscus .....	1
Callistemon .....	3	Xanthosia .....	1
Melaleuca .....	8	Actinotus .....	1
Leptospermum .....	4	Trachymene .....	2
Lysicarpus .....	1	Platycarpidium .....	1
Xanthostemon .....	2	Astrotricha .....	1
Angophora .....	3	Petroselinum .....	1
Eucalyptus .....	40	Helosciadium .....	1
Lithomyrtus .....	1	Daucus .....	1
Acmena .....	2	Eryngium .....	2— 22
Eugenia .....	3	<i>Araliaceæ.</i>	
Jambosa... ..	2	Panax .....	1
Barringtonia .....	2— 92	Sciadophyllum .....	1— 2
<i>Cucurbitaceæ.</i>		<i>Caprifoliaceæ.</i>	
Luffa .....	2	Sambucus .....	2
Cucumis .....	2	<i>Loranthaceæ.</i>	
Cucurbitella .....	1	Loranthus .....	15
Trichosanthes .....	3	Tupeia .....	2
Bryonia .....	1	Viscum .....	1— 18
Zehneria .....	1	<i>Rubiaceæ.</i>	
Lagenaria .....	1— 11	Asperula .....	3
<i>Passifloreæ.</i>		Pomax .....	1
Disemma .....	2	Opercularia .....	2
<i>Portulacææ.</i>		Spermacoce .....	5
Portulaca .....	7	Cephaelis .....	1
Calandrinia .....	2	Psychotria .....	4
Trigastrotheca .....	1	Pavetta .....	3
Mollugo .....	2	Canthium .....	6
Trianthema .....	3	Pogonolobus .....	1
Brachypyxis .....	2	Morinda .....	2
Sesuvium .....	1	Creocarpus .....	1
Glinus .....	1	Nertera .....	1
Tetragonia .....	1— 20	Hedyotis .....	6
<i>Mesembryanthemææ.</i>		Rondeletia .....	1
Mesembryanthemum .....	1	Gardenia .....	4
<i>Crassulaceæ.</i>		Guettarda .....	1— 42
Tillæa .....	1	<i>Euphorbiaceæ.</i>	
<i>Cunoniaceæ.</i>		Euphorbia .....	6
Callicoma .....	1	Excœcaria .....	1

## CALYCIFLORÆ (continued).

<i>Euphorbiaceæ</i> (continued). SP.		<i>Compositæ</i> (continued). SP.	
Omalanthus .....	2	Siegesbeckia .....	1
Cœlebogyne .....	1	Wedelia .....	3
Elachocroton .....	1	Wollastonia .....	3
Tragia .....	1	Bidens.....	2
Petalostigma .....	1	Diodontium .....	1
Echinocroton .....	1	Spilanthes .....	2
Acalypha.....	2	Glossogyne.....	2
Amperea .....	1	Flaveria .....	1
Mappa.....	1	Cotula.....	1
Baloghia .....	1	Myriogyne .....	3
Ricinocarpus .....	1	Sphæromorphæa .....	1
Bertya .....	1	Soliva .....	1
Adriana .....	1	Calocephalus .....	1
Beyera .....	1	Pycnosorus.....	1
Croton .....	6	Cassinia .....	1
Monococcus .....	1	Ozothamnus .....	1
Briedelia.....	1	Rutidosia.....	2
Phyllanthus .....	7	Ixiolæna... ..	1
Synostemon .....	4	Rytidochlamys .....	1
Melanthesa.....	2	Podolepis .....	3
Leptonema.....	1	Chrysocephalum .....	1
Micranthemum .....	1	Helichrysum .....	4
Glochidion .....	2	Helipterum.....	2
Elachopetalum .....	1	Gnaphalium .....	3
Poranthera .....	1— 50	Erechthites .....	2
<i>Compositæ.</i>		Senecio .....	2
Vernonia.....	1	Coleocoma .....	1
Eurybia .....	2	Haplotaxis .....	1
Vittadinia .....	2	Kippistia.....	1
Therogeron.....	1	Leuzea .....	1
Minuria .....	1	Picris .....	1
Calotis.....	5	*Crepis .....	1
Brachycome .....	5	Sonchus .....	2— 93
Lagenophora .....	1	<i>Stylidiæ.</i>	
Solenogyne.....	1	Stylidium .....	16
Sphæranthus .....	2	<i>Lobeliaceæ.</i>	
Conyza .....	1	Lobelia .....	9
Spiropodium .....	1	Pratia .....	1— 10
Blumea .....	5	<i>Campanulaceæ.</i>	
Pluchea .....	2	Wahlenbergia.....	1
Rhodanthemum .....	4	<i>Goodeniaceæ.</i>	
Oliganthemum .....	1	Goodenia.....	20
Monenteles.....	3	Calogyne.....	1
Eclipta .....	1		

## CALYCIFLORÆ (continued).

<i>Goodeniaceæ</i> (continued).	SP.	<i>Epacrideæ</i> (continued).	SP.
<i>Velleya</i> .....	4	<i>Leucopogon</i> .....	8
<i>Dampiera</i> .....	2	<i>Monotoca</i> .....	2
<i>Leschenaultia</i> .....	1	<i>Epacris</i> .....	3
<i>Scævola</i> .....	9— 37	<i>Poncelletia</i> .....	1
<i>Epacrideæ.</i>		<i>Melichrus</i> .....	1
<i>Styphelia</i> .....	1	<i>Acrotriche</i> .....	1
<i>Lissanthe</i> .....	1	<i>Trochocarpa</i> .....	1— 19

## COROLLIFLORÆ.

<i>Myrsineæ.</i>		<i>Asclepiadeæ.</i>	
<i>Myrsine</i> .....	1	<i>Microstemma</i> .....	2
<i>Ægiceras</i> .....	1— 2	<i>Cynoctonum</i> .....	5
<i>Sapoteæ.</i>		<i>Bidaria</i> .....	2
<i>Mimusops</i> .....	1	<i>Leichhardtia</i> .....	1
<i>Sersalisia</i> .....	3	<i>Gongronema</i> .....	2
<i>Ixiocarpus</i> .....	1— 5	<i>Gymnema</i> .....	1
<i>Ebenaceæ.</i>		<i>Marsdenia</i> .....	4
<i>Diospyros</i> .....	1	<i>Tylophora</i> .....	2
<i>Maba</i> .....	4— 5	<i>Oxystelma</i> .....	1
<i>Oleïnæ.</i>		<i>Gymnanthera</i> .....	1
<i>Olea</i> .....	1	<i>Hoya</i> .....	1
<i>Notelæa</i> .....	3— 4	<i>Sarcostemma</i> .....	1
<i>Jasmineæ.</i>		<i>Rhyncharrhena</i> .....	1— 24
<i>Jasminum</i> .....	6	<i>Bignoniaceæ.</i>	
<i>Loganiaceæ.</i>		<i>Tecoma</i> .....	3
<i>Strychnos</i> .....	1	<i>Spathodea</i> .....	2— 5
<i>Logania</i> .....	1	<i>Hydrophyllæ.</i>	
<i>Dichotomostachys</i> .....	1	<i>Hydrolea</i> .....	1
<i>Mitrasacme</i> .....	16— 19	<i>Convolvulaceæ.</i>	
<i>Gentianeæ.</i>		<i>Calystegia</i> .....	1
<i>Limnanthemum</i> .....	4	<i>Convolvulus</i> .....	2
<i>Villarsia</i> .....	1	<i>Ipomœa</i> .....	17
<i>Canscora</i> .....	1	<i>Breweria</i> .....	3
<i>Erythræa</i> .....	1— 7	<i>Polymeria</i> .....	2
<i>Apocynæ.</i>		<i>Evolvulus</i> .....	1
<i>Parsonsia</i> .....	6	<i>Cressa</i> .....	1
<i>Lyonsia</i> .....	1	<i>Dichondra</i> .....	1
<i>Balfouria</i> .....	1	<i>Cuscuta</i> .....	1— 29
<i>Wrightia</i> .....	1	<i>Boragineæ.</i>	
<i>Alstonia</i> .....	2	<i>Heliotropium</i> .....	9
<i>Tabernæmontana</i> .....	1	<i>Lobophyllum</i> .....	1
<i>Carissa</i> .....	2	<i>Cynoglossum</i> .....	3
<i>Cerbera</i> .....	1	<i>Trichodesma</i> .....	3
<i>Melodinus</i> .....	1	<i>Tournefortia</i> .....	2
<i>Alyxia</i> .....	1— 17	<i>Halgania</i> .....	1
		<i>Ehretia</i> .....	1— 20

## COROLLIFLORÆ (continued).

<i>Solanaceæ.</i>	SP.	<i>Primulaceæ.</i>	SP.
<i>Solanum</i> .....	25	<i>Micropyxis</i> .....	1
<i>Physalis</i> .....	2	<i>Pedalinæ.</i>	
<i>Nicotiana</i> .....	1	<i>Josephinia</i> .....	2
<i>Datura</i> .....	1— 29	<i>Myoporinæ.</i>	
<i>Scrophularinæ.</i>		<i>Myoporum</i> .....	5
<i>Duboisia</i> .....	1	<i>Pholidia</i> .....	3
<i>Büchneria</i> .....	2	<i>Stenochilus</i> .....	3
<i>Vandellia</i> .....	3	<i>Eremophila</i> .....	3— 14
<i>Bonnaya</i> .....	3	<i>Verbenaceæ.</i>	
<i>Mimulus</i> .....	3	<i>Avicennia</i> .....	2
<i>Microcarpæa</i> .....	1	<i>Clerodendron</i> .....	5
<i>Limnophila</i> .....	1	<i>Vitex</i> .....	5
<i>Gratiola</i> .....	2	<i>Premna</i> .....	2
<i>Centranthera</i> .....	1	<i>Pityrodia</i> .....	1
<i>Veronica</i> .....	1	<i>Newcastelia</i> .....	1
<i>Morgania</i> .....	2	<i>Dennisonia</i> .....	1
<i>Peplidium</i> .....	1	<i>Callicarpa</i> .....	3
<i>Herpestis</i> .....	1	<i>Teucrium</i> .....	1
<i>Rhamphicarpa</i> .....	1	<i>Verbena</i> .....	3
<i>Stemodia</i> .....	2	<i>Lippia</i> .....	1— 25
<i>Scoparia</i> .....	1	<i>Labiataæ.</i>	
<i>Artanema</i> .....	1— 27	<i>Lycopus</i> .....	1
<i>Acanthaceæ.</i>		<i>Salvia</i> .....	1
<i>Stemodiopsis</i> .....	1	<i>Westringia</i> .....	1
<i>Adenosma</i> .....	1	<i>Ajuga</i> .....	1
<i>Ruellia</i> .....	1	<i>Anisomeles</i> .....	3
<i>Eranthemum</i> .....	1	<i>Teucrium</i> .....	3
<i>Rostellularia</i> .....	2	<i>Mentha</i> .....	3
<i>Adhatoda</i> .....	1	<i>Plectranthus</i> .....	6
<i>Hygrophila</i> ...	1	<i>Prostanthera</i> .....	1— 20
<i>Dicliptera</i> .....	1	<i>Plumbaginææ.</i>	
<i>Hypoestes</i> .....	2	<i>Plumbago</i> .....	1
<i>Nelsonia</i> .....	1— 12	<i>Ægialitis</i> .....	1— 2
<i>Lentibulariæ.</i>		<i>Plantaginææ.</i>	
<i>Utricularia</i> .....	8	<i>Plantago</i> .....	1

## MONOCHLAMYDÆ.

<i>Nyctagineæ.</i>		<i>Amaranthaceæ (continued).</i>	
<i>Boerhaavia</i> .....	1	<i>Ptilotus</i> .....	3
<i>Amaranthaceæ.</i>		<i>Nyssanthus</i> .....	2
<i>Alternanthera</i> .....	3	<i>Amaranthus</i> .....	3
<i>Trichinium</i> .....	8	<i>Achyranthes</i> .....	1
<i>Gomphrena</i> .....	5	<i>Deeringia</i> .....	1— 26

## MONOCHLAMYDEÆ (continued).

<i>Salsoleæ.</i>	SP.	<i>Thymeleæ.</i>	SP.
Blitum .....	2	Wickstroemia .....	1
Rhagodia .....	3	Pimelea .....	9— 10
Chenopodium.....	3		
Atriplex .....	4	<i>Santalaceæ.</i>	
Anisacantha .....	3	Anthobolus.....	2
Kentropsis .....	1	Santalum .....	1
Kochia .....	3	Exocarpus .....	2
Enchylæna .....	1	Leptomeria.....	1
Salsola.....	1	Thesium .....	1— 7
Chenopodina .....	1		
Arthrocnemum .....	1	<i>Urticeæ.</i>	
Halocnemum .....	2— 25	Aphananthus .....	1
		Urtica .....	2
<i>Polygoneæ.</i>		Parietaria .....	1
Muehlenbeckia .....	1	Morus .....	2
Polygonum.....	9	Dorstenia .....	1
Rumex .....	3— 13	Ficus .....	12— 19
<i>Laurineæ.</i>		<i>Casuarineæ.</i>	
Cryptocarya .....	1	Casuarina .....	6
Tetranthera.....	2		
Cassytha.....	2	<i>Conifereæ.</i>	
Gyrocarpus.....	1— 6	Frenela .....	4
		Podocarpus.....	1
<i>Proteaceæ.</i>		Araucaria .....	2— 7
Conospermum .....	1		
Helicia .....	1	<i>Ephedreæ.</i>	
Persoonia .....	5	Ephedra .....	1
Orites? .....	1		
Grevillea.....	22	<i>Cycadeæ.</i>	
Hakea.....	7	Macrozamia .....	1
Lomatia .....	1	Cycas .....	2— 3
Stenocarpus .....	2		
Banksia .....	5— 45	<i>Piperaceæ.</i>	
		Piperomia .....	2

## MONOCOTYLEDONEÆ.

<i>Orchideæ.</i>		<i>Orchideæ (continued).</i>	
Calanthe.....	1	Acianthus .....	1
Spiranthes .....	1	Corysanthes .....	1
Microtis .....	1	Chiloglottis.....	1
Dipodium .....	2	Arthrochilus .....	1
Cryptostylis .....	1	Cyrtostylis .....	1
Cymbidium.....	3	Glossodia .....	1
Dendrobium .....	3	Oberonia.....	1— 28
Sarcophilus.....	1		
Pterostylis .....	6	<i>Philydreæ.</i>	
Caladenia .....	2	Philydrum .....	1



## MONOCOTYLEDONEÆ (continued).

<i>Irideæ.</i>	SP.	<i>Liliaceæ</i> (continued).	SP.
Patersonia .....	2	Chlorophytum .....	1
<i>Amaryllideæ.</i>		Cæsia .....	3
Calostemma .....	1	Tricoryne .....	1
Crinum .....	3— 4	Dianella .....	3
<i>Scitamineæ.</i>		Cordylina .....	1
Hellenia .....	1	Asparagus .....	1
<i>Hydrocharideæ.</i>		Eustrephus .....	2
Anacharis .....	1	Geitonoplesium .....	2
Hydrocharis .....	1	Thysanotus .....	2
Ottelia .....	2	Sowerbæa .....	1
Vallisneria .....	2— 6	Xanthorrhœa .....	2— 22
<i>Najadeæ.</i>		<i>Hypoxideæ.</i>	
Najas .....	2	Hypoxis .....	1
<i>Zosteraceæ.</i>		<i>Aphyllanthææ.</i>	
Thalassia .....	2	Laxmannia .....	1
<i>Alismaceæ.</i>		<i>Commelyneæ.</i>	
Alisma .....	2	Commelyna .....	4
<i>Juncagineæ.</i>		Ancilema .....	5
Cyenogeton .....	2	Cyanotis .....	1
Ouvirandra .....	2	Cartonema .....	1— 11
Aponogeton .....	1	<i>Taccaceæ.</i>	
Potamogeton .....	4	Tacca .....	1
Ruppia .....	1	<i>Aroideæ.</i>	
Leiostigma .....	1	Arum .....	1
Triglochin .....	1— 12	Typhonium .....	1
<i>Hæmodoraceæ.</i>		Caladium .....	1— 3
Hæmodorum .....	3	<i>Orontiaceæ.</i>	
<i>Dioscoreæ.</i>		Gymnostachys .....	1
Dioscorea .....	1	Pothos .....	1— 2
<i>Smilacinæ.</i>		<i>Pistiaceæ.</i>	
Smilax .....	1	Lemna .....	1
Ripogonum .....	1— 2	<i>Typhaceæ.</i>	
<i>Melanthaceæ.</i>		Typha .....	1
Anguillaria .....	1	Sparganium .....	1— 2
Kreysigia .....	1— 2	<i>Pandaneæ.</i>	
<i>Pontederiaceæ.</i>		Pandanus .....	3
Limnostachys .....	1	<i>Palmæ.</i>	
<i>Liliaceæ.</i>		Livistona .....	2
Bulbine .....	2	Seaforthia .....	1
Dichopogon .....	1	Calamus .....	1— 4

## MONOCOTYLEDONEÆ (continued).

<i>Xyrideæ.</i>		SP.	<i>Gramineæ</i> (continued).		SP.
Xyris .....		5	Agrostis .....		1
<i>Eriocaulææ.</i>			Perotis .....		1
Eriocaulon .....		4	Aristida .....		4
<i>Desvauxiææ.</i>			Stipa .....		1
Desvauxia .....		2	Amphipogon .....		1
<i>Xerotidææ.</i>			Danthonia .....		1
Xerotes .....		4	Bromus .....		1
<i>Flagellariææ.</i>			Glyceria .....		1
Flagellaria .....		1	Vulpia.....		1
<i>Junceæ.</i>			Poa .....		2
Juncus .....		5	Eragrostis .....		3
<i>Restiaceæ.</i>			Triodia .....		3
Restio .....		3	Phragmites.....		1
Lepyrodia .....		1	Eriachne.....		5
Calorophus.....	1—	5	Pappophorum .....		2
<i>Cyperoideæ.</i>			Triraphis.....		2
Cyperus .....	14		Ectrosia .....		2
Kyllingia.....	1		Dactyloctenium .....		1
Hypælyptum .....	1		Chloris .....		3
Fuirena .....	2		Cynodon.....		2
Chondrachne .....	1		Paspalum .....		1
Chorizandra .....	1		Panicum .....		25
Isolepis .....	5		Oplismenus .....		1
Scirpus .....	4		Setaria.....		3
Heleocharis .....	6		Cenchrus.....		2
Fimbristylis .....	24		Lappago .....		1
Rhynchospora .....	1		Neurachne .....		1
Schoenus.....	3		Isachne .....		1
Chætospora .....	1		Xerochloa .....		2
Lepidosperma.....	2		Spinifex .....		2
Cladium .....	5		Anthistiria .....		6
Gahnia .....	1		Andropogon .....		16
Psittacoschoenus .....	1		Erianthus .....		2
Caustis .....	1		Imperata.....		1
Scleria.....	2		Ischæmum .....		4
Carex .....	6—	82	Rottboellia .....		3
<i>Gramineæ.</i>			Ophiurus .....		1
Sporobolus .....	2		Hemarthria.....		1
Cinna .....	1		Zoysia .....		1
			Microlæna .....		1
			Oryza .....		1
			Leersia .....		1—118

## ACOTYLEDONEÆ.

<i>Polypodiaceæ.</i>	SP.	<i>Polypodiaceæ</i> (continued).	SP.
Acrostichum .....	2	Gleichenia .....	4
Platycerium .....	2	Platyzoma .....	1
Campyloneuron .....	1	Schizæa .....	1
Gymnogramme .....	1	Lycopodium .....	1— 49
Notochlæna .....	2		
Polypodium .....	7	<i>Lycopodiaceæ.</i>	
Cheilanthes .....	2	Psilotum .....	1
Adiantum .....	2	Tmesipteris .....	1
Pteris .....	5	Lycopodium .....	5— 7
Blechnum .....	1		
Lomaria .....	1	<i>Marsileaceæ.</i>	
Asplenium .....	4	Marsilea .....	1
Doodia .....	2	Azolla .....	1— 2
Nephrodium .....	4		
Aspidium .....	1	<i>Ophioglosseæ.</i>	
Lindsæa .....	1	Ophioglossum .....	3
Davallia .....	1	Botrychium .....	1— 4
Dicksonia .....	2		
Ceratopteris .....	1	<i>Characeæ.</i>	
		Chara .....	3
		Nitella .....	3— 6

*Præcursores ad Floram Indicam.* By J. D. HOOKER, Esq., M.D.,  
F.R.S. & L.S., and T. THOMSON, Esq., M.D., F.R.S. & L.S.

(Continued from page 103 of this volume.)

## Nat. Ord. CAPRIFOLIACEÆ.

BESIDES the many well-known points of close affinity between *Caprifoliaceæ* and *Rubiaceæ*, an examination of the Indian plants of the former Order enables us to add one which has generally been supposed to present a good distinguishing character between them, namely the large stipules present in two genuine species of *Lonicera* itself. In *Sambucus* the leaves are sometimes described as stipulate, an appearance due in the Indian species to a pair of reduced basal pinnules.

The structure of the ovules in this Order is similar in many respects to that of *Corneæ*, and is the same as in many *Rubiaceæ*. These, in the very earliest stage of *Viburnum Tinus*, consist of a minute mamillary curved nucleus encircled with an annulus, which is the only integument; this annulus is no further developed, but as the ovule grows to maturity, it continues unchanged at its apex. The fully-developed ovule hence has no apparent integuments; that represented by the annulus, being the one which answers to the inner (secundine) in more highly-developed ovules,

is in *Viburnum*, congenitally adnate with the nucleus. In *Viburnum* the ovary is generally 1-celled, in *V. Tinus* 2-celled, and the solitary pendulous ovule hangs transversely, so that the raphe is neither turned towards the placental axis, nor diametrically away from it. The testa is formed of the walls of the nucleus and its adherent integument. The cavity of the ovary is full of stellate hairs. The three stigmas are free in a very early stage, and the ovule is developed in one of them above the plane passing through the base of the calyx-lobes. The three stigmas hence probably represent as many free ovaries which afterwards combine, and the developed cells are produced downwards forming cavities in the peduncle.

(Conspectus Generum.)

A. LONICERÆ. Corollæ *tubus elongatus*. Stylus *filiformis*.  
Rhaphe *extrorsa*.

1. LONICERA, *Desf.* Calycis limbus 5-dentatus. Corolla tubulosa. Stamina 5. Ovarium 2-3-loculare; ovulis plurimis, pendulis. Bacca carnosae, oligo- v. poly-sperma, 2-3-locularis, v. septis obliteratis 1-locularis.—Frutices v. suffruticuli erecti v. scandentes; foliis in paucis stipulatis.
2. LEYCESTERIA, *Wall.* Calycis limbus 5-lobus, lobis linearibus. Corolla infundibuliformis. Stamina 5. Ovarium 5-loculare; ovulis perplurimis, pendulis. Bacca carnosae, 5-locularis, poly-sperma.—Frutex erectus; caule ramoso, fistuloso; foliis junioribus sæpe lobatis; floribus bracteatis; bracteis amplis.
3. TRIOSTEUM, *L.* Calycis limbus 5-lobus, lobis foliaceis. Corolla tubulosa. Stamina 5. Ovarium 3-5-loculare; ovulis solitariis pendulis. Bacca coriacea.—Suffruticuli; foliis basi subconnatis connatisve.
4. ABELIA, *Br.* Calycis tubus compressus; limbus 5-partitus, lobis foliaceis. Corolla infundibuliformis. Stamina 4. Ovarium 3-loculare; loculis duobus pluri-ovulatis, ovulis abortientibus; tertio 1-ovulato fertili. Bacca coriacea, 1-sperma.—Frutices debiles; foliis crenatis; floribus involucreis.
5. DICHILANTHE, *Thwaites.* Calycis limbus breviter tubulosus, intus 5-squamatus, 5-partitus. Corolla infundibuliformis, curva, ore bilabiato, labio superiore 2-dentato, inferiore 3-dentato. Stamina 5. Ovarium 2-loculare; ovulis solitariis, pendulis.—Arbor; ramulis teretibus, ad nodos gemmiferis; foliis lanceolatis, coriaceis, integerrimis; floribus terminalibus, sessilibus, confertis.

B. SAMBUCEÆ. *Corolla rotata v. breviter tubulosa*. Stigmata 3, sessilia. *Rhaphe introrsa v. lateralis*.

6. VIBURNUM, *L.* *Calycis* limbus parvus, 5-dentatus. *Corolla* rotata v. breviter infundibuliformis v. tubulosa. *Stamina* 5. *Ovarium* 1-, rarius 2-3-loculare; ovulis solitariis, pendulis. *Bacca* abortu 1-locularis, 1-sperma.—Frutices *erecti*; foliis *simplicibus, integris*; floribus *corymbosis*.

7. SAMBUCUS, *Tourn.* *Calycis* limbus 5-dentatus v. obsoletus. *Corolla* rotata. *Stamina* 5. *Ovarium* 3-5-loculare; ovulis solitariis, pendulis. *Bacca* 3-5-pyrena.—Suffrutices v. *Herbæ*; foliis *impari-pinnatisectis, basi spurie 2-stipulatis v. 2-glandulosis*; floribus *corymbosis*.

# I. LONICERA, *L.*

## § A. STIPULATÆ. *Stipulæ* interpetiolares magnæ.

1. LONICERA STIPULATA (*Hf. & T.*). Ramis foliis stipulisque subtus inflorescentiaque dense lanuginosis, stipulis orbiculatis reflexis, foliis distichis oblique ovato-lanceolatis subserratis, floribus subcapitatis, capitulis axillaribus pedunculatis, baccis polyspermis.

*Hab.* In Himalaya orientali temperata. Sikkim! alt. 6000-10,000 ped., *J. D. H.* (fl. Mart. Apr.) (v. v.)

*Species insignis.* *Folia* 4-6 unc. longa, coriacea, supra læte viridia, subrugosa, basi inæqualia. *Stipulæ*  $\frac{1}{2}$  unc. latæ, marginibus recurvis. *Flores* erecti, bracteati. *Calycis* lobi lineari-oblongi. *Corolla*  $\frac{2}{3}$  unc. longa, alba, infundibuliformis, basi subgibbosa, laxè lanata. *Stamina* inclusa. *Bacca* ovoidea, flava.

2. LONICERA GLAUCOPHYLLA (*Hf. & T.*). Glaberrima, ramis gracilibus, foliis distichis breve petiolatis lanceolatis v. ovato-lanceolatis acuminatis sinuato-serratis subtus glaucis puberulis, stipulis orbiculatis reflexis.

*Hab.* Himalaya orientali temperata. Sikkim! alt. 5000-6000 ped., *J. D. H.* (v. v.)

*Folia* 3-4 unc. longa, submembranacea; nervis subtus gracilibus. *Flores* ignoti.

§ B. BRACTEATÆ. *Erectæ.* *Pedunculi* 2-flori. *Bracteæ* 2, magnæ, membranaceæ v. foliaceæ, orbiculatæ, flores amplectentes.

3. LONICERA HISPIDA (*Pall. ex Willd. MSS.*). Ramis hispido-pilosis, foliis oblongis lineari- v. ovato-oblongis obtusis acutis acuminatisve ciliatis utrinque sparse pilosis, pedunculis robustis deflexis, bracteis amplis membranaceis ciliatis flores fere velantibus, corolla infundibuliformi breviter 5-loba.—*D.C. Prodr.* iii. 338; *Ledeb. Flor. Ross.* ii. 389. *Ic.* t. 212.—*L. bracteata*, Royle, *Ill.* p. 237. t. 53.

Var. *β. setosa*; ramulis foliisque utrinque setoso-hispidis, foliis basi subcordatis.

*Hab.* Himalaya alpina interiore, alt. 11,000–14,000 ped. Kunawur!

*Munro.* Garwhal! et Kumaon! *Strachey & Winterbottom.* Sikkim!

*J. D. H.*—Var. *β.* Sikkim, alt. 13,000 ped., *J. D. H.* (fl. Jul.) (v. v.)

*Distr.* Soongaria; Siberia Altaica.

*Frutex* robustus, 2–4-pedalis. *Rami* paucifoliati, cortice laxo; ramulis interdum flexuosis. *Folia* brevè petiolata, 1–2 unc. longa, submembranacea. *Pedunculi* pilosi, foliis breviores. *Bracteæ* (maiores quam in stirpe Sibirica)  $\frac{1}{2}$ –1 unc. longæ, valde concavæ, acutæ, ciliatæ, pubescentes, subplicatæ. *Flores* supra medium exserti, glabri v. pilosi. *Corolla* late tubuloso-infundibuliformis, basi gibba. *Bracteolæ* minimæ. *Fructus* ovoideus; seminibus plurimis, singula serie sub 8.

4. *LONICERA GLAUCA* (*Hf. & T.*). Fruticulus ramosus glaber, foliis ( $\frac{1}{2}$ – $\frac{2}{3}$  pollicaribus) lineari-oblongis obtusis marginibus scaberulis recurvis subtus glaucis, pedunculis brevibus, bracteis late ovato-oblongis ciliatis, corolla longe tubulosa tubo gracili, ovariis liberis.

*Hab.* In Himalaya interiore occidentali et Tibetia alpina, alt. 13,000–16,000 ped. Kumaon! et Garwhal! *Strachey & Winterbottom.* Zanskar! Piti! Nubra! *T. Thomson.* (fl. Jul.) (v. v.)

*Fruticulus* humilis. *Rami* glauci, virgati, cortice laxo. *Flores* foliis æquilongi. *Corolla* bracteis duplo longior, glabra v. pilosula. *Bracteæ* basi connatæ v. liberæ,  $\frac{1}{2}$  unc. longæ; bracteolis inconspicuis. *Baccæ* globosæ, seminibus majusculis.

5. *LONICERA ASPERIFOLIA* (*Hf. & T.*). Frutex ramosus, ramulis puberulis, foliis ovato-oblongis cordatisve subacutis ciliatis superne glabratis subtus glaucis pubescentibusque marginibus tenuiter recurvis et demum crispatis, pedunculis brevissimis, bracteis late oblongis obtusis, corolla longe tubulosa, ovariis liberis.—*Xylostem asperifolium*, Decaisne in Plant. Jacquem. 77. t. 85.

*Hab.* In Himalaya et Tibetia occidentali temperata et subalpina, alt. 10,000–14,000 ped. Gugi! *Strachey & Winterbottom.* Kunawur, Jacquemont. Zanskar! et Kashmir! *T. Thomson.* (fl. Jun. Jul.) (v. v.)

*L. glauca* affinis, sed omnibus partibus major, et foliis latioribus subtus pubescentibus. *Ramuli* interdum sparse setosi. *Folia* juniora basi rotundata, seniores latiora, basi cordata; *petioli* graciles,  $\frac{1}{4}$  unc. longi. *Corollæ* pilosæ tubus lobis triplo longior. *Bracteolæ* 0. *Baccæ* ovoideæ; seminibus paucis magnis.

§ C. *ERECTÆ.* *Pedunculi* 2-flori. *Bracteæ* setacæ v. foliaceæ, flores non amplexantes.

† *Corollæ limbus non-bilabiatus.* *Bracteolæ magnæ, plerumque connatæ et ovaria cingentes* (in *L. obovata parvæ*).

6. *LONICERA LIGUSTRINA* (*Wall. in Roxb. Fl. Ind. ii. 179*). Arbuscula, ramulis pubescentibus, foliis lanceolatis obtuse acuminatis mar-

- ginibus costaque ciliolatis glaberrimisve, pedunculis brevibus, bracteis setaceis, ovariis liberis bracteolis connatis semicinctis, corollæ tubo gracili supra basin gibboso.—*D.C. Prodr.* iv. 334; *Wight, Ill.* iii. 1025.
- Hab.* Himalaya centrali subtropica. Nipal, alt. 4000 ped.! *Wallich.* Montibus Khasia, alt. 4000–6000 ped.! *Simons, &c.* Montibus Nilgherrie, *Wight, &c.* (fl. Mart. Apr.) (v. v.)
- Arbuscula* 10–15-pedalis, foliosa. *Folia* breve petiolata, 1–3 unc. longa, venosa, plana, subnitida. *Pedunculi*  $\frac{1}{10}$ – $\frac{1}{8}$  unc. longi, pubescentes. *Corolla*  $\frac{1}{2}$  unc. longa, glabra v. pilosa. *Bacca* globosa; seminibus 2–4, magnis.
7. *LONICERA TOMENTELLA* (*Hf. & T.*). Ramulis foliis subtus pedunculisque tomentosis, foliis ( $\frac{3}{4}$ –1 poll.) lineari-oblongis lanceolatisve obtusis acutisve, pedunculis breviusculis, bracteis foliaceis lineari-oblongis, bracteolis in cupulam connatis, ovariis glaberrimis ovoideis, calycis limbo brevi lobis obtusis, corolla basi subæquali pilosula, genitalibus inclusis.
- Hab.* Himalaya orientali temperata. Sikkim, alt. 8000–12,000 ped.! *J. D. H.* (fl. Jul.) (v. v.)
- Frutex* 10–12-pedalis; ramulis distichis, strictis. *Folia* opaca. *Bractee*  $\frac{1}{4}$ – $\frac{3}{4}$  unc. longæ. *Ovaria* libera v. connata. *Corolla* alba, vix  $\frac{1}{2}$  unc. longa, ore æquali, lobis brevibus, fauce villosa. *Baccæ* atræ, magnit. pisi; seminibus parvis, numerosissimis.
8. *LONICERA SERICEA* (*Royle, Herb.*). Ramulis novellis foliisque subtus præcipue sericeis, foliis (1–1 $\frac{1}{2}$  poll.) lineari-obovatis oblongo-lanceolatisve obtusis, axillis nervorum subtus tomentellis, pedunculis gracilibus, bracteis linearibus, bracteolis in cupulam connatis, calycis limbo cupulari truncato, corolla pubescenti-pilosa basi gibba breviter 5-loba ore æquali.
- Hab.* Himalaya temperata. Kumaon?! *Hb. Royle.* Sikkim, alt. 11,000 ped.! *J. D. H.* (fl. Jun.) (v. v.)
- Arbuscula* gracilis, ramulis strictis demum glabris. *Folia* sublonge petiolata. *Pedunculi* fructus filiformes, glabri. *Flores* sericei. *Ovaria* glabra, distincta v. connata. *Baccæ* parvæ, atræ. *Semina* numerosa, oblonga.—Descriptio ex exemplaribus floriferis Royleanis, et fructiferis Sikkimensibus in quibus bracteolæ delapsæ sunt (an nullæ?).
9. *LONICERA ANGUSTIFOLIA* (*Wall. Cat.* no. 480). Glaberrima v. foliis ramulisque junioribus pilosulis, foliis (pollicaribus) lanceolatis oblongo-lanceolatisve acutis acuminatisve subtus pallidis, pedunculis gracilibus, bracteis linearibus foliaceisve, bracteolis in cupulam connatis, corolla basi æquali glabra breviter 5-fida ore æquali fauce villosa.—*D.C. Prodr.* iv. 337; *Journ. Hort. Soc. Lond.* iii. 238.
- Hab.* Himalaya temperata, a Sikkim! alt. 10,000–12,000 ped., *J. D. H.*, ad Kashmir! 6000–10,000 ped., *T. T.* (fl. Mai. Jun.) (v. v.)
- Frutex* 6–12-pedalis; ramulis gracilibus. *Folia* seniora utrinque glaberrima, latitudine varia, plerumque lanceolata, interdum oblongo-

- obovato-lanceolata. *Pedunculi*  $\frac{1}{2}$ –1 unc. longi. *Bracteæ* sæpissime foliaceæ,  $\frac{1}{2}$ – $\frac{1}{3}$  unc. longæ. *Ovaria* sæpius bracteolis immersa. *Calycis* lobi obtusiusculi. *Corolla* vix  $\frac{1}{2}$  unc. longa, alba v. pallide rosea, odora. *Bacca* magnit. pisi. *Semina* pauca, 1–6.
10. *LONICERA RUPICOLA* (Hf. & T.). Rigida, ramulis puberulis, foliis ( $\frac{1}{2}$ – $\frac{3}{4}$  poll.) lineari-oblongis subacutis marginibus recurvis subtus niveo-tomentosis, pedunculis brevibus, bracteis linearibus foliaceis subtus albo-tomentosis, bracteolis discretis ovaria subæquantibus, calycis lobis elongatis pilosis, corolla glabrata basi æquali, genitalibus inclusis. *Hab.* In Tibetia orientali et centrali alpina. Gugi, alt. 13,500 ped.! *Strachey & Winterbottom*, et in Tibetia Sikkimensi, alt. 15,000–17,000 ped.! *J. D. H.* (fl. Jul.) (v. v.)  
*Fruticulus* rigidus, 2–4-pedalis. *Folia* coriacea, supra reticulatim venulosa. *Flores*  $\frac{1}{2}$  unc. longi. *Calycis* lobi lanceolati, in tubum brevem connati. *Corollæ* tubus subcylindricus, ore æquali, lobis patentibus lineari-oblongis.
11. *LONICERA SPINOSA* (Jacquem. MSS.). Glaberrima, rigida, ramis lignosis, ramulis spinescentibus, foliis lineari-oblongis marginibus obtusis recurvis, pedunculis brevissimis, bracteis foliaceis linearibus marginibus recurvis, bracteolis in cupulam connatis, calycis limbo cupulari lobis ovatis acutis, corollæ tubo gracili basi æquali lobis inæqualibus, genitalibus exsertis.—*L. linearis*, Hb: Royle.—*Xylosteum spinosum*, Decaisne, Plant. Jacquem. 78. t. 86.  
*Hab.* In Himalaya interiore alpina et temperata. Kunawur, 11,000–12,000 ped.! *Jacquemont*; T. T. Garwhal, 11,500 ped.! *Strachey & Winterbottom*. In Tibetia occidentali, alt. 12,000–15,000 ped.! T. T., et orientali, alt. 15,000–17,000 ped.! *J. D. H.* (fl. Jul.) (v. v.)  
*Fruticulus* rigidus, totus glaberrimus, cortice pallido v. albo. *Folia* sparsa, parva, coriacea. *Flores* ramulis abbreviatis aggregati, pro planta magni. *Corolla*  $\frac{1}{2}$ – $\frac{3}{4}$  unc. longa, tubo quam in affinibus longiore et graciliore.
12. *LONICERA MYRTILLUS* (Hf. & T.). Ramulis puberulis, foliis ( $\frac{1}{2}$ – $\frac{1}{2}$  poll.) elliptico- v. obovato-oblongis obtusis subtus glaucis, pedunculis brevissimis elongatisve, bracteis foliaceis lineari-oblongis, bracteolis in cupulam connatis, corolla campanulata basi æquali, lobis brevibus subæqualibus fauce pilosa, genitalibus inclusis.  
*Hab.* Himalaya temperata et alpina. Marri, 9000 ped.! *Fleming*. Kishtwar, 8000–12,000 ped.! T. Thomson. Kunawur! *Lance*. Sikkim, 11,000–14,000 ped.! *J. D. H.* (fl. Jun.) (v. v.)  
*Fruticulus* parvus, sæpius depressus, ramis prostratis. *Folia* breve petiolata, glaberrima, basi acuta, supra luride viridia. *Flores* breves. *Corolla* latiuscula, sub  $\frac{1}{2}$  unc. longa. *Baccæ* parvæ; semina pauca, sub 4.
13. *Lonicera parvifolia* Edgew. in Wall. Cat. 9058, non Bunge; Edgew. in Linn. Trans. xx. p. 60.



*Hab.* In Himalaya temperata et alpina. Kunawur, alt. 11,000–13,000 ped.! *T. T.* Kumaon, alt. 12,000 ped.! *Blinkworth, Strachey & Winterbottom.* Sikkim, alt. 12,000–14,000 ped.! *J. D. H.* (fl. Jun.) (v. v.)

Omnia sicut *L. Myrtillus* nisi bracteæ latiores et foliaceæ.

14. *LONICERA PURPURASCENS* (*Hf. & T.*). Ramulis pubescentibus, foliis ovatis oblongisve obtusis basi rotundatis truncatisve utrinque pubescentibus, pedunculis gracilibus folio brevioribus, bracteis linearibus arcuatis ciliatis tenuissime glandulosis, bracteolis rotundis connatis submembranaceis glabris, calyce cyathiformi brevissimo sub-integro marginibus reflexis, corolla basi gibba puberula ore æquali breviter 5-fido.—*Xylosteum purpurascens*, Jacquem. MSS.; Decaisne in *Plant. Jacquem.* 79. t. 87.

*Hab.* Himalaya occidentali temperata. Kashmir, *Jacquemont.* (fl. Jun.) *L. parvifolia* affine, differt foliis majoribus, corolla pilosa, bacca 4-sperma, et calyce pateræformi reflexa.

15. *Lonicera obovata* (*Herb. Royle*).

*Hab.* Himalaya occidentali temperata et subalpina. Kishtwar! et Kunawur! alt. 8000–13,000 ped., *T. T.* Kumaon, alt. 12,500 ped.! *Strachey & Winterbottom.* Sikkim, alt. 11,000–14,000 ped.! *J. D. H.* (fl. Jun.) (v. v.)

Omnia *L. parvifolia*, sed bracteæ lineari-subulatae, bracteolæ parvæ, corollæ tubus gracilior basi valde gibbosus, et genitalia exserta. Ab *L. microphylla* differt forma corollæ, et bracteolis parvis.

### †† Corolla bilabiata.

#### a. Bracteolæ magnæ plerumque connatæ.

16. *LONICERA QUINQUE-LOCULARIS* (*Hardwick in As. Res.* vi. 351; *Wall. in Roxb. Fl. Ind.* ii. 174). Ramulis puberulis, foliis (1–2 poll.) oblongis ellipticis ovato-cordatisve puberulis, pedunculis brevissimis, bracteis minimis setaceis, bracteolis in cupulam ciliatam connatis, corollis pubescenti-pilosis basi æqualibus profunde bilabiatis labio superiore breviter 4-lobo inferiore lineari-oblongo.—*L. diversifolia*, Wall. in Roxb. *Flor. Ind.* ii. 178; Hook.  *Ic. Plant.* t. 807; Lindley in *Bot. Reg.* xxx. t. 33.—*L. Royleana*, Wall. *Cat.* 478.

*Hab.* In Himalaya occidentali temperata, alt. 5000–11,000 ped. A Kumaon! *Blinkworth*, ad Kashmir! *T. Thomson.* Necnon in Bhotan! *Griffith.* (fl. Jun.) (v. v.)

*L. incanæ*, Decaisne (*persica*, Jaub. & Sp. et ? *L. Kurdistanæ*, Boiss.) proxima, differt solummodo bracteolis cupulæformibus.

*Folia et ramuli* plus minusve pubescentes v. subvelutini. *Folia* utrinque acuta v. obtusa v. basi interdum cordata, seniora interdum remote sinuato-dentata. *Calycis* limbus cupularis, 5-fidus. *Ovaria* plerumque libera. *Filamenta* pilosa. *Baccæ* magnit. pisi, sessiles, quaternæ. *Semina* 8–10, atra.

17. *LONICERA HYPOLEUCA* (Decaisne, *Plant. Jacquem.* 81. t. 89). Ramulis pubescenti-pilosis glandulosisque, foliis ( $\frac{2}{3}$ – $1\frac{1}{3}$  poll.) oblongis cordato-rotundatisve obtusis puberulis subtus glaucis, pedunculis  $\frac{1}{3}$ – $\frac{1}{2}$  unc. longis, bracteis subfoliaceis lineari-oblongis, bracteolis glanduloso-hispidulis in cupulam connatis, corollis glanduloso-pilosis basi gibbis ad medium bilabiatis.—Cf. *L. aurea* (Aucher-Eloi, 4340), quæ differt ramulis glabris.

*Hab.* Himalaya occidentali temperata, alt. 8000–10,000 ped. Kunawur et Piti! *Jacquemont*, &c. Garwhal! *Strachey & Winterbottom.* (fl. Jun.) (v. v.)

Fruticulus depressus. *Folia* breve petiolata. *Pedunculi* stricti. *Bractea* sub  $\frac{1}{4}$  unc. longæ. *Ovaria* plerumque in unum connata. *Calycis* lobi parvi. *Corolla* sub  $\frac{1}{2}$  unc. longa. *Filamenta* glabra. *Baccæ* parvæ, bracteolis semi-immersæ.

18. *LONICERA DECIPIENS* (Hf. & T.). Ramulis gracilibus, foliis ( $1\frac{1}{2}$ –2 pollicaribus) ovatis oblongisque acuminatis membranaceis glabris, pedunculis elongatis puberulis, bracteis minimis setaceis, bracteolis orbiculatis ovaria discreta æquantibus, corolla bilabiata basi gibba breviter campanulata, stylo hirsuto.

*Hab.* In Himalaya orientali temperata. Sikkim, alt. 10,000–12,000 ped. ! *J.D.H.* (fl. Jul.) (v. v.)

*L. Tataricæ*, *L.* valde affinis et simillima; differt bracteolis magnis, calycisque dentibus brevioribus.—*Frutex* 10–15-pedalis. *Flores* glabrati, vix  $\frac{1}{2}$  unc. longi. *Corollæ* faux pilosa. *Stylus* villosus. *Baccæ* diametr. pisi, rubræ demum nigræ. *Semina* sub 8.

β. *Bracteolæ* parvæ v. nullæ (vid. *L. obovata* in subsectione priore).

19. *LONICERA ORIENTALIS* (Lam. *Dict.* i. 731). Tota glaberrima, foliis membranaceis (2–4 poll.) ovatis ellipticis ovato-lanceolatisve acuminatis nervis tenuibus, pedunculis gracilibus, bracteis parvis subulatis setaceisque, bracteolis minimis orbiculatis, corolla brevi basi subgibba profunde bilabiata, filamentis styloque sericeis.—*D.C. Prodr.* iv. 337; *Jaub. & Spach, Illust.* t. 71.—*L. Govaniana*, *Wall. Cat.* No. 481; *D.C. Prodr.* iv. 337.

*Hab.* Himalaya occidentali temperata, alt. 6000–10,000 ped.; a Kumaon! *Blinkworth*, ad Kashmir! *T. Thomson.* (fl. Jun.) (v. v.)

*Distr.* Caucasus, Iberia.

Frutex gracilis, omnino glaber, nisi secus nervos foliorum subtus, filamenta stylusque. *Petiolis* subgraciles. *Pedunculi*  $\frac{1}{2}$ –1 poll. longi. *Ovaria* sæpiissime in fructum pyriformem connata. *Calycis* lobi subulati. *Corolla*  $\frac{1}{3}$  unc. longa. *Baccæ* nigræ.

20. *LONICERA HETEROPHYLLA* (Decaisne, *Plant. Jacquem.* 30. t. 38). Ramulis glaberrimis, foliis obovatis v. elliptico-lanceolatis acutis acuminatisve basi attenuatis integris sinuato-lobatisve ciliatis, petiolis tenuissime glandulosis, pedunculis elongatis folio brevioribus, bracteis

lineari-subulatis, bracteolis minimis, calycis limbo obsoleto, corolla hispidula bilabiata basi gibba.

*Hab.* Himalaya occidentali temperata; Kunawar ad Choupienne, alt. 6000–7000 ped., *Jacquemont.* (fl. Jun.)

Proxime affinis videtur *L. orientali*, et verosimiliter varietas.

21. *LONICERA MICROPHYLLA* (*Willd. in Ræm. & Sch. Syst.* v. 258).

Glaberrima v. pilosula, foliis plerumque in ramulos breves fasciculatis ( $\frac{3}{4}$ –1 poll.) obovatis oblongisve obtusis, pedunculis gracilibus, bracteis setaceis, bracteolis 0, calycis limbo truncato, corolla glaberrima tubo gracili basi gibbo supra medium dilatato bilabiato.—*D.C. Prodr.* iv. 336; *Led. Flor. Ross.* n. 213.

*Hab.* In Tibetia occidentali temperata; alt. 11,000–14,000 ped.! *T. Thomson.* (fl. Jun.) (v. v.)

*Distr.* Altai, Soongaria.

Fruticulus parvus, habitu *L. parvifoliæ*. *Folia* forma varia, plerumque obovata, rarius lineari-oblonga, subtus pallida sed vix glauca. *Pedunculi*  $\frac{1}{2}$ –1 unc. longi. *Corolla*  $\frac{1}{2}$  unc. longa. *Filamenta* glabra. *Ovaria* discreta v. connata. *Baccæ* parvæ; seminibus sub 6.

22. *LONICERA DISCOLOR* (*Lindl. in Bot. Reg.* 1844, sub t. 33, et vol. xxxiii. 1847, t. 44). Glaberrima, foliis ( $1\frac{1}{2}$ –2 poll.) late oblongis ellipticisve obtusis membranaceis nervis tenuibus, junioribus acutis sparse puberulis, pedunculis gracilibus, bracteis setaceis, bracteolis minimis, calycis limbo cupulari truncato, corolla brevi pilosa basi lata gibba infra medium bilabiata.

*Hab.* Himalaya occidentali temperata, alt. 9000–10,000 ped. Kashmir! et Kishtwar! *T. Thomson.* (fl. Jun.) (v. v.)

*L. orientali* simillima, sed calycis lobi fere obsoleti corollaque brevior pilosa.

23. *LONICERA ALPIGENA* (*L. Sp. Pl.*). Sparse glanduloso-pilosula, foliis (2–4 poll.) ovato-lanceolatis attenuato-acuminatis membranaceis basi rotundatis cordatisve, pedunculis elongatis pilosis, bracteis parvis subulatis, bracteolis minimis ovatis, calycis limbo breviter lobato, corolla basi gibba glanduloso-pubescenti bilabiata labio superiore breviter lobato, stylo sericeo.—*L. Webbiana*, Wall. Cat. No. 476; *D.C. Prodr.* iv. 336.—*L. oxyphylla*, Edgew. in Linn. Trans. xx. p. 60.

*Hab.* Himalaya temperata, alt. 8000–10,000 ped., a Kumaon! *Blinkworth*, *Strachey & Winterbottom*, ad Marri! *Fleming*, et in Bhotan! *Griffith.* (fl. Jun.) (v. v.)

*Distr.* Alpibus Europæ centralis.

Affinis *L. orientali*, sed glanduloso-pubescent, foliis majoribus, longe acuminatis, corollisque glandulosis. A *L. discolor* differt foliis.

§ D. SCANDENTES. *Corolla* bilabiata.

24. *LONICERA JAPONICA* (*Thunb. Jap.* 89, *fid. Wall. Cat.* 473). Ramulis petiolis pedunculisque patentim pilosis, foliis breve petiolatis

ovato-lanceolatis acuminatis basi cordatis ciliatis subtus crebre reticulatim venosis tomentosis, floribus axillaribus solitariis v. ramulis axillaribus capitatis v. in spicas terminales dispositis, bracteis brevibus bracteolisque parvis ciliatis, ovario glabro, corolla longissima ( $1\frac{1}{2}$  poll.) hirsuta.—*Wall. in Roxb. Fl. Ind. ii. 174; And. Bot. Rep. ix. 583 (fid. Wall.)*; *Bot. Reg. i. t. 70.—L. macrantha, D.C. Prodr. iv. 333.—Caprifolium macranthum, Don, Prodr. 140.—L. confusa, D.C. l. c.—L. hirtiflora, Champion.*

*Hab.* Himalaya centrali et orientali, alt. 6000–9000 ped. Nipal! *Wallich.*

Sikkim! *J. D. H. Mont. Khasia! Griffith, Masters. (fl. Mai.) (v. v.)*

*Distr.* Japan; China!

*Var. β.* Ramis gracilioribus, foliis subtus glaucis, floribus brevioribus.

*Hab.* Montibus Khasia, alt. 5000–6000 ped.! *Da Mack; J. D. H. & T. T. (fl. Jun.) (v. v.)*

*Rami* robusti, ramuli stricti. *Folia* 2–3 unc. longa, coriacea, supra glabra, subtus pallidiora interdum velutina. *Flores* flavi, vix odori.

*Obs.* *L. longiflora, D.C. Prodr. iv. 331, Caprifol. longiflorum, Sabine MSS. in Lindl. Bot. Reg. t. 1232 (Nepaliæ incola?), est glaberrima, et verosimiliter planta Chinensis.*

25. *LONICERA GLABRATA (Wall. Cat. 474, et in Roxb. Fl. Ind. ii. 175).* Ramulis glabris pubescentibusve, foliis ovato-cordatis ovato-oblongisve acuminatis subtus glabris puberulisve, floribus versus apices ramulorum axillarium breviter racemosis, bracteis brevissimis subulatis, bracteolis minimis, corolla ( $\frac{1}{2}$  poll.) glaberrima tubo infundibuliformi.—*D.C. Prodr. iv. 334.—L. ovata, Herb. Ham. Wall. Cat. 6300.*

*Var. β.* Ramulis foliisque oblongo-lanceolatis subtus tomentosis.

*Hab.* Himalaya centrali et orientali temperata, alt. 5000–7000 ped. Nepal! *Wallich.* Sikkim! *J. D. H. Assam (Montibus Khasia?), Masters. (fl. Oct.–Dec.) (v. v.)—Var. β. Bhotan! Griffith.*

*L. Japonicæ* affinis, differt foliis non ciliatis, plerumque latioribus et subtus glaberrimis, ramulis non patentim pilosis, calyce brevioris, et corolla multo minore tubo brevioris glaberrima.

26. *LONICERA LOUREIRII (D.C. Prodr. iv. 334).* Ramulis pubescentibus junioribus hirsutis villosisve, foliis oblongo-lanceolatis longe acuminatis basi rotundatis cordatisve ciliatis subtus pubescenti-pilosis glabratissive, pedunculis robustis axillaribus et ad apices ramulorum fasciculatis bifloris, bracteis linearibus elongatis interdum foliaceis, corollæ ( $\frac{1}{2}$  poll.) pilosæ tubo infundibuliformi lobis breviusculis.—*Hook. Ic. Plant. 806 (est forma foliis brevioribus).—L. acuminata, Wall. Cat. 472, et in Roxb. Fl. Ind. ii. 176; D.C. Prodr. iv. 334.—Xylosteum Loureirii, Bl. Bijl. 653.*

*Hab.* Himalaya centrali et orientali, alt. 7000–11,000 ped. Nepal! *Wallich; J. D. H. Sikkim! J. D. H. (fl. Aug.–Oct.) (v. v.)*

*Distr.* Java.

Planta variabilis, præcipue indumento; ab affinibus (sequente excepto) distinguitur bracteis fructu æquilongis v. longioribus interdum foliaceis.

27. *LONICERA LESCHENAULTII* (Wall. Cat. No. 471, et in Roxb. Fl. Ind. ii. 178). Tota nisi in pagina superiore foliorum cano-pubescent v. cano-tomentosa, foliis ovato-cordatis ovatisve acuminatis, pedunculis axillaribus v. in fasciculos racemosve terminales dispositis, ovariis canis, bracteis linearibus, corollæ tubo ( $1-1\frac{1}{2}$  poll.) gracili.—Wight, Ill. ii. 72. t. 120 et 121 B; Wight & Arn. Prodr. 389.—*L. mollis*, Wight, Ill. ii. 71; Wall. Cat. 6301.

Hab. Montibus Malabaricæ, alt. 5000-7000 ped. frequens! *Leschenault*, &c. (fl. Jan.-Mar.)

Facile distinguitur foliis latis, pube v. tomento cano, ovariis canis, bracteis elongatis, tuboque corollæ gracili.

28. *LONICERA GRIFFITHII* (Hf. & T.). Glaberrima, foliis gracile petiolatis ovatis oblongis orbiculatisve obtusis, floribus in capitula terminalia dispositis, pedunculis calycibus bracteisque parvis pilosis, corolla ( $\frac{2}{3}$  poll.) glanduloso-pilosa tubo infundibuliformi.

Hab. Affghanistan! *Griffith*.

*L. Etrusca* proxima, differt foliis supremis non connatis.—Folia  $1-1\frac{1}{2}$  unc. longa, interdum fere latiora quam longa, in eodem ramulo forma varia, inferiora angustiora, suprema interdum cordata. Calyx longe ciliatus.

Quid *Lonicera*, Affghanistan, Griff. 751? (folia tantum).

*L. lanceolata*, Wall. in Roxb. Fl. Ind. ii. 177; D.C.? et Wall. Cat. No. 475; in Herb. Linn. Soc. (ubi corolla deest); D.C. Prodr. iv. 334?

*L. bicolor*, Kl. in Prinz Waldem. Him. 71 (fid. Pritzels, Icon. Bot.)?

*L. macrogyne*, Kl. in Prinz Waldem. Him. 72?

## II. LEYCESTERIA, Wall.

1. *Leycesteria formosa*, Wall. in Roxb. Flor. Ind. ii. 181. Cat. No. 470; D.C. Prodr. iv. 338; Wight, Ill. ii. 72. t. 121 D.

Hab. Himalaya temperata, alt. 5000-10,000 ped. frequens; a Simla! Comta. Dalhousie, ad Sikkim! J. D. H., et Montibus Khasia, alt. 5000-6000 ped., J. D. H. & T. T. (fl. Jun.-Aug.) (v. v.)

Rami fistulosi. Petioli basi mediante linea elevata crassa stipulari juncti. Folia juniora sæpissime lobata, et serrata. Bacca septis interdum ab axi solutis. Gemmæ foliiferæ iis *Lonicerae* omnino similes.—Genus vix a *Lonicera* distinctum.

## III. TRIOSTEUM, L.

1. *Triosteum Himalayanum*, Wall. in Roxb. Fl. Ind. ii. 180; D.C. Prodr. iv. 330.

Hab. Himalaya temperata, alt. 10,000-12,000 ped. Kumaon! Strachey & Winterbottom. Nipal! Wallich. Sikkim! J. D. H. (fl. Jul.-Sept.) (v. v.)

Quid *T. hirsutum*, Roxb. Fl. Ind. ii. 180. e Chittagong?

IV. ABELIA, *Br.*

1. *Abelia triflora* (Br. in Wall. Plant. As. Rar. 14. t. 15; D.C. Prodr. iv. 339; Wight, Ill. ii. 72. t. 121 C.

*Hab.* Himalaya occidentali temperata, alt. 6000–9000 ped.; a Kumaon! *Blinkworth*, ad Marri! *Fleming*. (fl. Jun.–Aug.) (v. v.)

V. DICHILANTHE, *Thw.*

1. *Dichilanthe Zeylanica*, Thwaites in Hook. Kew Journ. Bot. vol. viii. 270 & 376. t. 8 A. (ubi stipulæ delendæ).

*Hab.* Sylvis tropicis insulæ Ceylon! *Thwaites*.

VI. VIBURNUM, *L.*

A. *Corolla* breviter campanulata, v. infundibuliformis.

1. VIBURNUM COTINIFOLIUM (*Don*, *Prodr.* 141). Foliis ovatis rotundatisve subintegerrimis subtus albis corymboque subsessili dense stellato-tomentosis, calycis lobis brevissimis.—*D.C. Prodr.* iv. 327; *Wight*, *Ill.* 72. t. 121 A; *Lindl. Bot. Reg.* xix. t. 1650.—*V. polycarpum*, Wall. Cat. 455; D.C. Prodr. iv. 328.

Var. *α*. Foliis utrinque subvelutino-tomentosis.

Var. *β*. Foliis superne glabris.

Var. *γ*. Foliis ovato-oblongis oblongo-lanceolatisve.

*Hab.* Himalaya temperata, alt. 7000–9000 ped. Bhotan! *Griffith*. Kumaon! *Blinkworth*, &c. Simla! *Comta. Dalhousie*, &c. (fl. Jun. Jul.) (v. v.)

*Ramuli* robusti, ad apices tantum foliosi. *Folia* breve crasse petiolata, 3–5 poll. longa, acuta v. obtusa, reticulatim venosa, opaca, integerrima v. crenulata, basi rotundata v. cordata. *Corymbi* rami crassi, ramosi. *Ovarium* glaberrimum. *Bacca* oblonga,  $\frac{1}{3}$  unc. longa; endocarpio compresso, utrinque 2-sulcato; stylo brevissimo conico.

B. *Corolla* rotata. *Corymbus* subumbellatus.

2. VIBURNUM CORYLIFOLIUM (*Hf. & T.*). Ramulis petiolis corymbisque breve pedunculatis patentim stellatim tomentosis subvillosisve, foliis late ovato-cordatis acuminatis grosse dentatis utrinque molliter pubescentibus, corymbi radiis elongatis.

*Hab.* Montibus Khasia, regione temperata, prope Kala-panee, alt. 5000–6000 ped.! *J. D. H. & T. T.* (frt. Jun.) (v. v.)

*Distr.* ? China.

*Frutex.* *Folia* 2 poll. longa, submembranacea, seniora superne glabrata, nervis parallelis, petiolis brevibus v. elongatis. *Flores* non visi. *Bacca* parvæ, late ovatæ, acutæ, nitidæ, utrinque sulcatæ, valde compressæ, hinc concavæ.

3. VIBURNUM STELLULATUM (*Wall. Cat.* 463). Foliis ovatis ovato-cordatis lanceolatisve caudato-acuminatis grosse sinuato-dentatis, supra glabris subtus secus nervos sparse stellatim puberulis pilosulisque,

corymbo subsessili decomposito alabastrisque cinereo-pubescentibus.—*D.C. Prodr.* iv. 327; *Wall. Plant. As. Rar.* ii. p. 54. t. 169.—*V. Mullaha*, Ham. in Don, *Prodr.* 141; *D.C. l. c.*

*Hab.* In Himalaya centrali et occidentali temperata, alt. 7000–10,000 ped. Nepal! *Wallich.* Kumaon! et Garwhal! *Blinkworth*; *Strachey & Winterbottom.* Simla! *Madden*, &c. (fl. Jul. Aug.) (v. v.)

*Ramuli* cinerei. *Folia* 3–6 unc. longa, submembranacea, basi cuneata, rotundata v. cordata, supra medium dentata; costa subtus sæpius appresse pilosula. *Corymbus* multiradiatus; flores minimi. *Ovaria* dense pubescentia. *Calycis* lobi oblongi. *Corolla* rotata, extus pubescens. *Stamina* brevia. *Stylus* brevis, subcolumnaris, stigmatē capitato. *Bacca* ovato-oblonga, valde compressa, magnitudine varia ( $\frac{1}{4}$ – $\frac{1}{2}$  unc. longa), nitida; endocarpio longitudinaliter hinc uni-, inde bi-sulcato.

4. *Viburnum involucratum* (*Wall. Cat.* 458; *D.C. Prodr.* iv. 327).

*Hab.* In Himalaya temperata tota, alt. 7000–11,000 ped., frequens a Sikkim! *J. D. H.*, ad Jamu! *T. T.* (fl. Mai.–Jun.) (v. v.)

Omnia *V. stellulati* (cujus verosimiliter varietas est), sed ramis gracilioribus, foliis minoribus interdum fere glaberrimis, corymbisque laxioribus.—Forma a cl. Wallichio lecta cum corymbo foliato certe monstrosa est; in Sikkim haud infrequens.

5. *VIBURNUM CORDIFOLIUM* (*Wall. Cat.* 462). Foliis ovato-cordatis acuminatis creberrime argute dentatis, nervis subtus petiolis pedunculisque sparse stellato-puberulis, corymbis sessilibus bracteatis radiis elongatis, ovariis glabris.—*D.C. Prodr.* iv. 327.—*V. furcatum*, Bl. in *Herb. Hook.*

*Hab.* In Himalaya temperata, alt. 10,000–12,000 ped. Bhotan! *Griffith.* Sikkim! *J. D. H.* Nepal! *Wallich.* Kumaon! *Blinkworth.* (fl. Mai.–Jun.) (v. v.)

*Distr.* Japan!

Frutex v. arbuscula. *Rami* teretes, glabri. *Folia* terminalia, submembranacea, 3–5 poll. longa, nervis plurimis subparallelis, juniora subtus stellato-tomentosa. *Corymbi* radii interdum bracteolati. *Calycis* lobi stellatim pilosi. *Corolla* late rotata. *Stamina* parva. *Stylus* late conicus. *Stigma* 3-lobum. *Bacca* late ovata, endocarpio utrinque medio sulcato.

6. *VIBURNUM FÆTIDUM* (*Wall. Cat.* 466; *Plant. As. Rar.* i. p. 49. t. 61). Ramulis petiolis corymbis nervis foliorum subtus pube stellata furfuraceis, foliis elliptico-oblongis basi cuneatis trinerviis grosse sinuato-dentatis serratisve, corymbis pedunculatis, ovariis glabris.—*D.C. Prodr.* iv. 325.

Var. *β. premnacea*, corymbo foliis 3–4 involucrato.—*V. premnaceum*, *Wall. Cat.* 461; *D.C. Prodr. l. c.*

*Hab.* Montibus Khasia regione tropica, alt. 3000–5000 ped.! *De Silva*, &c.; Montibus Taong dong Birmæ! *Wallich.* (fl. Jun.) (v. v.)

*Frutex* 6-10-pedalis. *Rami* foliosi. *Folia* 1-4 unc. longa, obtusa, acuta v. acuminata, interdum integerrima, nervis paucis, ad axillas sæpius tomentellis. *Corymbi* compositi, non ampli, ebracteati v. foliis 1-4 involucrati. *Flores* parvi, bracteolati. *Calycis* lobi late ovati. *Corolla* rotata, tubo brevi. *Stylus* brevis, late conicus. *Bacca* ovata, acuta, nitida,  $\frac{1}{4}$  unc. longa, forma *V. mollis*.

7. *VIBURNUM LUTESCENS* (*Blume, Bijd.* 655). Petiolis corymbisque spurie axillaribus pedunculatis pube stellulata furfuraceis, foliis oblongis ellipticisve crebre grosse serrato-dentatis utrinque glabris, ovariis glaberrimis.—*D.C. Prodr.* iv. 324.—*V. Colebrookianum*, Wall. Cat. 460; *D.C. l. c.*—(*V. Sundaicum*, Miq.)

*Hab.* In Himalaya orientali tropica. Sikkim, alt. 2000-4000 ped. ! *J. D. H.* Assam ! Silhet ! et Montibus Khasia ! alt. 0-4000 ped. frequens ! *De Silva*, &c. (fl. Mart. Apr.) (v. v.)

*Distr.* Insulis Malayanis.

*Frutex* 6-8-pedalis. *Rami* robusti, foliosi. *Folia* submembranacea, 4-7 poll. longa, nervis subtus interdum sparse puberulis. *Corymbi* longe pedunculati, spurie axillares, i. e. in ramulis axillaribus brevissimis inconspicuis terminales. *Flores* parvi, ebracteolati. *Calycis* lobi oblongi, concavi. *Corolla* rotata. *Stamina* brevissima. *Baccæ* parvæ, rubræ; endocarpio compresso, utrinque convexo, obscure sulcato.—*Ramuli* floriferi in exemplaribus Malayanis plerumque evoluti sunt; corymbique dein terminales evadunt.

8. *VIBURNUM PUNCTATUM* (*Ham. in Don Prodr.* 142). Glaberrimum v. corymbo terminali puberulo, foliis coriaceis ellipticis elliptico-lanceolatisve acuminatis subtus punctulatis, corymbi ramis angulatis floribusque bracteatis, ovariis glaberrimis.—*D.C. Prodr.* iv. 324.—*V. acuminatum*, Wall. Cat. 465; *D.C. l. c.*; *Wight & Arn. Prodr.* 388; *Wight, Icon.* t. 1021; *Spicileg.* t. 89.

*Hab.* In Himalaya tropica, alt. 1000-5000 ped., a Bhotan ! *Griffith*, ad Kumaon ! *Strachey & Winterbottom.* Montibus Concan ! et Canaræ ! *Stocks*, &c., et Malabariæ ! *Noton*, &c. (fl. Jan.-Mart.) (v. v.)

*Distr.* Java.

*Frutex* orgyalis. *Rami* robusti. *Folia* utrinque acuminata, nervis paucis, subtus subtilissime punctulata. *Corymbus* amplus. *Flores* parvi. *Calycis* lobi oblongi. *Corolla* rotata. *Bacca* majuscula,  $\frac{1}{2}$  unc. longa, oblonga, utrinque obtusa, compressa; endocarpio utrinque bisulcato.

9. *VIBURNUM INTEGERRIMUM* (*Wall. Cat.* 457). Foliis glaberrimis elliptico-oblongis integerrimis abrupte caudato-acuminatis paucinerviis, corymbo terminali pedunculato stellatim pubescente.—(Valde affine *V. sambucino*, *Blume*.)

*Hab.* Insula Penang ! *Wallich*; *Walker.* (fl. Aug.)

*Distr.* Java.

*V. punctato* affine, differt foliis subtus impunctatis, corymbi pedunculo



ramisque dense pubescentibus gracilioribus.—*Ramuli* et petioli juniores puberuli. *Flores* parvi.

C. *Corolla* rotata. *Corymbus* paniculatus v. thyrsiformis.

10. *VIBURNUM ODORATISSIMUM* (Ker, *Bot. Reg.* vi. t. 456). Glaberrimum, foliis coriaceis elliptico-ovatis obovatis lanceolatisve acuminatis integerrimis serratisve, petiolis crassis, corymbo glaberrimo terminali paniculato pedunculato ramis crassis brachiatis paucifloris.—*V. Irabutha*, Blume MSS. in *Herb. Hook.*

*Hab.* In Montibus Khasia regione tropica; alt. 4000 ped.! *Griffith, Masters, &c.* (fl. Nov.) (v. v.)

*Distr.* China! Japan!

*Frutex* 6–10 pedalis. *Rami* robusti. *Folia* 4–6 unc. longa, valde coriacea, utrinque lævia, latitudine varia. *Corymbus* pyramidatus, 3–4 pollicaris, ramis patentibus, decussatis, crassis, angulatis. *Ovarium* glaberrimum. *Calycis* limbus cupularis, dilatatus, vix lobatus. *Corolla* parva, rotata. *Bacca* ovoidea, tumida; endocarpio sectione transversa reniformi-rotundato; seminis sectione cyclica.

11. *VIBURNUM SIMONSII* (Hf. & T.). Foliis glaberrimis ovato- v. elliptico-lanceolatis acuminatis supra medium serratis nervis numerosis parallelis, corymbo terminali longe pedunculato pubescente, ramulis floribusque bracteolatis.

*Hab.* In regionibus temperatis Montium Khasia, alt. 5000–7000 ped.! *Simons, &c.* (fl. Jun.) (v. v.)

*Frutex* v. arbuscula 8–15 ped., fœtens. *Folia* suberecta, 2–4 poll. longa, coriacea, utrinque lævia, viridia, petiolis rubris, nervis validis. *Corymbus* floridus subcontractus, fructifer glabratus, conicus, brachiatus, ramis angulatis decussatis sæpius rubris; bracteolis subulatis. *Ovarium* glabrum. *Calycis* lobi ovati, obtusi. *Corolla* parva. *Stylus* conicus; stigmatate late capitato. *Bacca* oblonga,  $\frac{1}{4}$  unc. longa; endocarpio sectione transversa late reniformi, sinu lato subquadrato.

D. *Corolla* tubo elongato cylindrico; limbo patente.

12. *VIBURNUM ERUBESCENS* (Wall. Cat. 459 & 7474). Foliis ovatis ovato-cordatis lanceolatisve acuminatis supra medium dentato-serratis nervis numerosis, corymbis paniculatis terminalibus lateralibusque nutantibus longe pedunculatis ramis bracteolatis.—*D.C. Prodr.* iv. 329.

Var. *a.* Foliis elliptico-oblongis acuminatis utrinque glaberrimis v. subtus pilosulis, paniculis glabratis.—*V. erubescens*, Wall. Cat. l. c.; *Plant. As. Rar.* ii. p. 29; t. 134.

Var. *β.* Foliis late ovato-cordatis acuminatis subtus pilis albis sparsis, paniculis glabris puberulisve.

Var. *γ.* Foliis late oblongis obtusis acutisve subtus pilosulis, paniculis puberulis.—*V. Wightianum*, Wall. Cat. 3729; *Plant. As. Rar.* ii. p. 29; *Wt. & Arn. Prodr.* 388; *Wt. Ic.* 1024, *Spicil.* t. 90.

Var. *δ.* Ramulis petiolis costis foliorum paniculisque dense stellatis

tomentosis, foliis oblongo- v. elliptico-lanceolatis acuminatis, subtus ad nervos præcipue pubescentibus, pedunculo paniculæ crasso, ramis brevibus.

Var.  $\epsilon$ . Foliis parvis (pollicaribus) late oblongis obtusis subtus paniculisque parvis pubescentibus.

*Hab.* Montibus Himalayæ temperatæ, alt. 5000–11,000 ped., a Bhotan! *Griffith*, ad Kumaon! *Blinkworth*; et Montibus Malabariæ, *Wight*, &c.; et Ceyloniæ, alt. 4000–5000 ped., *Gardner*, &c.—Var.  $\alpha$ . in Nepal, Ceylon, Malabar, et Sikkim; var.  $\beta$ . Kumaon et Sikkim; var.  $\gamma$ . Malabar; var.  $\delta$ . Sikkim, alt. 10,000 ped.; var.  $\epsilon$ . Bhotan. (fl. Mart.–Mai.) (v. v.)

Species valde variabilis forma folii et indumento, sed habitu characteribusque certis facile recognoscenda.—Arbor parva, ramis sæpius gracilibus, foliis 1–4 poll. paniculisque pendulis nutantibusve operta. *Folia* utrinque viridia, nervis numerosis, axillis interdum barbatis. *Paniculæ* 1–4 unc. longæ, pedunculo gracili (in var.  $\delta$ . robusto), pauciv. multifloræ. *Flores*  $\frac{1}{2}$  unc. longi, ovario glaberrimo. *Calycis* lobi ovati, obtusi. *Corolla* tubo lobis ter longior, alba, straminea v. pallide rosea. *Bacca* parva, ovato-oblonga, endocarpio sectione transversa sublunato, sinu quadrato lato.

13. *VIBURNUM NERVOSUM* (*Don, Prodr.* 141). Foliis ellipticis oblongis lanceolatisve acuminatis serrulatis subtus petiolisque pubescentipilosis nervis numerosis parallelis, floribus præfoliaceis, corymbis brevibus sessilibus terminalibus erectis densifloris, bracteis tomentosis.—*D.C. Prodr.* iv. 327.—*V. grandiflorum*, Wall. Cat.

Valde affinis *V. fragrans*, Bunge, e China.

*Hab.* In Himalaya temperata et subalpina. Kumaon, alt. 10,000–12,000 ped.! *Blinkworth*, &c. Nepal! *Wallich*. Sikkim, alt. 11,000–13,000 ped, *J. D. H.* (fl. Mai.) (v. v.)

*Frutex* 3–6 pedalis, ramis robustis apice tantum foliiferis. *Folia* 3–4 $\frac{1}{2}$  poll. longa, axillis nervorum sæpe barbatis. *Flores* albi v. rosei, odori,  $\frac{3}{4}$  unc. longi, breve pedicellati, pedicellis ramisque inflorescentiæ robustis erectis patentim pilosis. *Corymbi* primum bracteis sericeotomentosis late ovatis tecti, ramis floribusque bracteolatis, bracteolis linearibus membranaceis. *Ovarium* glabrum. *Calycis* lobi breves, oblongi, obtusi. *Corollæ* tubus limbo quater longior. *Bacca*  $\frac{1}{3}$  unc. longa, oblonga, utrinque obtusa, compressa, endocarpio sectione transversa semicylindræo; seminis sectione cyclico.

14. *VIBURNUM FÆTENS* (*Decaisne in Plant. Jacquem.* 75. t. 84). Foliis oblongis elliptico-lanceolatisve acuminatis serratis, glaberrimis puberulisve floribus præfoliaceis, corymbis terminalibus sessilibus glabris bracteolatis.

*Hab.* In Himalaya occidentali temperata, alt. 6000–10,000 ped. Kishtwar! Chamba! Kashmir! Marri! *Jacquemont*, *Fleming*, *T. T.* (fl. Mai. Jun.) (v. v.)

Omnia *V. nervosi*, sed paniculis foliis petiolisque fere glaberrimis, et inflorescentiæ ramis laxis v. effusis. *Flores* foetidi (fid. *Jacquem.*). *Baccæ* ut in *V. nervoso* sed longiores,  $\frac{3}{4}$  unc. longæ.

E. *Corolla* tubulosa, brevis, cylindrica, limbo non explanato.

15. *VIBURNUM CORIACEUM* (*Bl. Bijd.*). Foliis glaberrimis oblongis et oblongo-lanceolatis longe acuminatis integerrimis subtus pallidis glanduloso-punctulatis, corymbo terminali pedunculato glanduloso-puberulo, ovario verrucoso, corolla glabra.

Var. *α*. Foliis elongatis (4–6 poll.), nervis utrinque 3–5 margine subparallelis.—*V. cylindricum*, Ham. in Don Prodr. 142.

Var. *β*. Foliis elongatis (4–6 poll.), nervis utrinque costæ 4–8 divergentibus.—*V. Zeylanicum*, Gardner.

Var. *γ*. Foliis brevioribus (2–4 poll.), nervis utrinque costæ 3–7 margine subparallelis, corollis interdum puberulis.—*V. capitellatum*, Wight & Arn. Prodr. 1022.

*Hab.* Var. *α*. In Himalaya temperata, alt. 4000–7000 ped., a Sikkim! *J. D. H.*, ad Simla! *T. T.*; Montibus Khasia, alt. 5000–7000 ped.! *Lobb*, &c.—Var. *β*. Insula Ceylon! alt. 6000 ped., *Walker*, &c.—Var. *γ*. Montibus Malabaræ! *Wight*, &c. (fl. Nov.–Mai.) (v. v.)

*Distr.* Java!

Arbuscula 15–20 pedalis. *Folia* longitudine varia, plerumque integerrima, juniora interdum sinuato-dentata, coriacea, supra læte viridia, subtus subglauca, axillis nervorum interdum barbatis, basi rotundata, subcordata v. angustata. *Corymbi* subumbellati, multiflori, ramis ebracteolatis crassiusculis patentibus. *Flores*  $\frac{1}{4}$  unc. longi. *Calycis* limbus breviter 5-lobus. *Corolla* lobis brevibus, obtusis, erectis; staminibus longe exsertis. *Baccæ* parvæ,  $\frac{1}{4}$  unc. longæ, elliptico-oblongæ, compressæ; endocarpio hinc longitudinaliter 1-sulcato, illinc 2-sulcato.

16. *VIBURNUM HEBANTHUM* (*Wight & Arn. Prodr.* 388). Foliis glaberrimis elliptico-oblongis lanceolatisve acutis obscure dentatis, corymbo pedunculato terminali glabrato pedicellis bracteolatis floribusque dense glanduloso-pubescentibus.—*Wight, Ic.* 1023.—*V. pubigerum*, Wight & Arn. Prodr. 389?—An var. *V. coriacei*?

*Hab.* Montibus Malabaræ! *Wight*, &c. (fl. Mart.)

*V. cylindrico* simillimum, differt foliis obtusioribus subtus non aut vix punctatis puberulisve, pedicellis bracteolatis ovariis, corollisque dense pubescentibus.

## VII. SAMBUCUS, L.

1. *SAMBUCUS EBULUS* (*Linn. Sp. Pl.* 385; *D.C. Prodr.* iv. 322). Herbacea, ramis sulcatis, stipulis sepius foliaceis, cyma obconica apice planiuscula.

*Hab.* In Himalaya occidentali temperata, alt. 6000–10,000 ped. Kishtwar! et Kashmir! *T. Thomson.* (fl. Apr.–Jun.) (v. v.)

*Distr.* Europa tota ! Africa borealis ! Caucasus ! Asia Minor ! Persia !  
*Bacca* interdum duplex et 6-pyrena.

2. *SAMBUCUS JAVANICA* (*Reinw. in Blume, Bijl.* 657). Suffruticosa, ramis teretiusculis, stipulis rarius foliatis, cyma basi foliosa ramis patentibus elongatis, baccis nigris.—*D.C. Prodr.* iv. 322.

*Hab.* In Himalaya orientali subtropica, alt. 3000–6000 ped. Sikkim !

*J. D. H.* In Montibus Khasia, alt. 4000–5000 ped. ! Assam ! *Masters* ;

*J. D. H. & T. T.* (fl. Jul. Aug.) (v. v.)

*Distr.* Java ! China !

*Foliola* interdum 8–9 poll. longa, basi sessili adnata, v. petiolata, cuneata v. cordata.

3. *SAMBUCUS ADNATA* (*Wall. Cat.* 482; *D.C. Prodr.* iv. 322). Suffruticosa, ramis sulcatis, stipulis rarius foliatis, cyma basi foliata ramis breviusculis, baccis rubris.

*Hab.* In Himalaya centrali et orientali temperata, alt. 6000–11,000 ped.

Nepal ! *Wallich.* Sikkim ! *J. D. H.* (fl. Jun. Jul.) (v. v.)

Extract of a Letter from Mr. GEORGE BARTER to R. BENTLEY,  
 Esq., F.L.S. Communicated by Professor BENTLEY.

[Read February 4th, 1858.]

River Kworra, Sept. 29, 1857.

WE have been now about three months in the river, laying down its course, sounding, surveying creeks and confluent, and making short journeys overland wherever the nature of the country or its inhabitants permitted. This place, Rabba, is the limit of former explorations, hence ours may be said only to commence from here ; in the meantime another large confluent to the Kworra has been discovered, but for several reasons not explored beyond three days' steaming up it. The intended overland journey to Soccattoo will be delayed till the rains cease, but the steamer will be pushed up this river as far as it proves navigable, if the rocks at Boussa, reported to be an obstacle to further progress, can be passed ; then perhaps Timbuctoo itself may be reached by Christmas.

In botany I perhaps have made some additions, to the river flora more especially ; altogether my numbered list now amounts to 1300 specimens, collected on the coast and in the river, besides various specimens of woods, fruits, &c. ; but in a small, overcrowded steamer like this, where half of us have not even a cabin to sleep in, you will imagine many obstacles to plant-preserving : damp below, violent rains and wind-tornadoes on deck,

destroy sometimes the work of weeks: we have not on board a tinned box, or indeed anything to make a water-tight case to put dried plants in.

In the lower parts of the river, till some distance beyond Abo, a rich vegetation is prevalent: Oil and Wine Palms abound; lofty forest trees, for the most part unknown to me, grow together so thickly at their summit, that the light is almost shut out below; trees overhanging the water were observed in this moist region covered with *Orchideæ*, principally of the genera *Angræcum* and *Bolbophyllum*; Ferns, as epiphytes, are also abundant. *Platyserium Stemaria* is on every tree. We however passed so quickly through these parts, that I had few opportunities of landing, therefore did little botanizing. Further up, where the country becomes picturesque, with hills and low mountains, these extensive forests disappear, and the air is drier; the Wine Palm is replaced by the Fan Palm; Oil Palms are still abundant, but less luxuriant; the huge *Bombax* with its laminated trunk gives place to the unsightly *Baobab*. The low mountains have all flat tops, seldom over 2000 feet high, therefore yielding few novelties; the sides of these are frequently bare, composed of sandstone or coarse iron conglomerate. The land from eighty miles below the confluence, to Rabba, wherever we have penetrated any distance, is of a sandy character mixed with iron, therefore not fertile; but it appears to be the true region of *Bassia Parkii*, or the Butter-tree, which occupies extensive tracts; it is a low scrubby tree, seldom more than 15 or 20 feet high, producing its long leaves on the extremities of the branches: the quantity of the butter offered us for sale would have filled a large ship. On some mountains lately visited on the Kworra I have gathered plants resembling the Cape vegetation, viz. *Proteas*, *Aloes*, *Lobelias*, *Brachystelma*, *Ixias*, *Nycterinias*, &c. I anticipate much novelty should we reach any of greater elevation. A low belt of ground always borders the river; in general this is swampy, covered with tall grasses, among which a beautiful *Gynerium* is now in flower; it seems identical with the *G. argenteum* of our gardens at home.

To the Palms of Africa I have at least added four undescribed species: one like *Geonoma*, the others *Calami*; probably many of the latter yet exist in the delta. I am not sure if the Fan Palm is known by specimens: near the river it is scattered along singly, generally at intervals one or two miles apart; only once have we seen them gregarious, on some mountains up the Kworra twelve miles from the confluence: it does not form a large head; the leaf-

petioles are short; the trunk sometimes 60 feet high, always of greatest diameter in the middle; so conspicuous is this, that it destroys all pretensions to beauty. The Oil Palm, which I believe is somewhere so figured, never approaches this form,—a small stem tapering from the base being universal with *Elæis*. On the disputed point—the sexes of *Elæis*,—the evidence gathered confirms the truth of Brown's statement: *both sexes occur on one tree*, although in most plants the sexes are on different trees: the plant producing *male flowers only*, is the one alone pierced for making wine. Plants having reputed medicinal properties are so common in use among the natives that I have ceased to pay much attention to them; nearly all which grow round their towns are used for some amazing virtue. A species of *Balanophorea*, *Thonningia sanguinea*, which I was requested to look after by Dr. Hooker, appears useful in dysentery, being used by several nations: it is a rare plant, but frequently seen exposed for sale in the markets; I have met with it but once, growing on the roots of a *Bauhinia*, its fine crimson flowers just appearing above the sand. Among many interesting fruits gathered is a species of gigantic Bread-fruit,—an *Artocarpus*, mentioned by Dr. Vogel as growing about the confluence; it is a large tree, 60 to 80 feet high, with smooth whitish bark yielding a milky juice, leaves ovate acuminate, shining and coriaceous: the fruit of this is said to weigh sometimes 30 lbs.; specimens which I have preserved are over 17 lbs., though many larger ones could have been obtained, had space allowed; seeds of this are about the size of small kidney beans, and form an important article of food to the natives; in the woods near the Model Farm this tree is most abundant. On one occasion, when botanizing there after rain, the sun shone out fiercely, loosening the hold of these fruits: the sound of their fall, as they crashed through the branches, was continuous throughout the afternoon, like the passing of large animals. Several kinds of *Anonas* and *Artabotrys* abound: the fruit of one of these is almost equal in flavour to an English apricot. Ferns have become very rare now, and epiphytic Orchids not any. Aquatic plants are not numerous. *Nymphaea dentata*, *Ceratopteris thalictroides*, *Pistia Stratiotes*, *Salvinia*, a species of floating plant\* (the latter is very beautiful, and will, if I can bring it home, be an interesting addition to the aquarium), *Chara*, sp., and two kinds of *Utricularia*, are forms of much interest. Several *Cyperaceæ*, a *Polygonum*, *Alisma sagittifolium*, *Jussiaea*, sp., with some other *Onagraceæ*, occupy most of the swampy

\* A specimen enclosed in the Letter shows this to be an *Azolla*.—SECR.

lagoons. Inland from the river, *Leguminosæ* are well represented; I have probably nearly 100 species of this family. *Polygaleæ* are beginning to appear; eight or nine species of the genus *Polygala* occur about Rabba. The curious cucumber-like fruit of two species of *Kigelia* overhang the river banks; specimens of each are, I believe, already in the Kew Museum; but the glory of this family is a large-growing *Spathodea*, now covered with flowers as large as the hand, and of a colour only equalled by *Rhododendron javanicum*. *Rubiaceæ* are abundant; many handsome shrubs deserving of cultivation occur in this order. *Sapotaceæ* are numerous as trees, and the *Ficus* tribe are found everywhere.

Of the little-known Guinea-Peach, *Sarcocephalus esculentus*, I have both flowers and fruit preserved; the latter is fine-looking, but not very palatable. Of other edible fruits, some species of *Spondias* are not amiss; while about seven distinct fruits, known as "plums," are also eaten. At Idda we purchased fruit of a kind of Mango; the tree producing this could not be seen, but I have preserved several species.

Of all fibres, gums, dyes, cottons, or manufactured articles, I have procured specimens for the Museum at the Botanic Gardens, likewise of woods or fruits, whenever space will allow: none of these can be sent to England till we return. According to present arrangements, I shall probably be rather longer engaged than the term of my appointment indicated when leaving home, a voyage up the Chadda being spoken of when we return down the Kworra; but unless much improvement takes place in the health of our party, very few I believe will care for another year on an African river.

In this note I have merely given a rough outline of the vegetation, in an unconnected form; it is written hastily in consequence of our starting some hours earlier than I expected, therefore much is omitted.

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On the Question whether Linnæus, in a spirit of ill-will, altered the spelling of the name of the genus *Buffonia*? By Mons. A. L. A. FÉE, Professor of Botany of the Faculty of Medicine at Strasburg. Communicated by THOMAS MOORE, Esq., F.L.S.\*

[Read February 4th, 1858.]

THE genus *Buffonia*, of the family of *Caryophyllæ*, the type of which is *Buffonia tenuifolia*, remarkable for the facility with which

\* Translated from the French.

the stamina vary in number, being sometimes reduced to two, and sometimes increased to eight, has been variously spelled, authors either admitting or not admitting the doubling of the *f*. We are about to show how this has occurred.

Although several botanists, even among contemporaries, have attributed this genus to Linnæus, it is certain that it belongs to Sauvages. What may have led to this mistake is, that the first official mention of the genus is found in the first volume of the 'Amœnitates Academicæ,' page 386, under the year 1749, in a thesis of Dassow, maintained under the presidency of Linnæus on the 12th of June 1747, and that the generic characters are there given, for the first time, four years before Sauvages himself published them. In this Thesis we read, "*Bufonia, auctore Sauvages;*" it should have been added, "*in litteris ad Linnæum.*"

The correspondence of these two illustrious men lasted for no less than eight-and-twenty years: it commenced on the 20th of January 1737, and terminated on the 3rd of May 1765, about eighteen months before the death of Sauvages. The letters, forty-three in number, are now in the possession of M. d'Hombre-Firmas, of Alais, grand-nephew of the celebrated Professor of Montpellier, who has long had the intention of publishing them. They are interesting, and I have been permitted to satisfy myself that they do not enable us to determine the precise date of the creation of the genus *Buffonia*. Nevertheless they contain the proof that it is anterior to 1745, inasmuch as in a letter of the 15th of October of that year, Linnæus says that the flower is tetrandrous, and that he will make sure of this on more perfect specimens, his own being incomplete; and long afterwards, in Letter XIX., of the 20th of August 1753, he begs Sauvages to settle his doubts on this point: "*quæso etiam hac æstate examines stamina Buffoniæ; Læfvingius scribit 4 esse in singulo flore.*"

It thus becomes perfectly certain that Sauvages, before definitively constituting the genus *Buffonia*, referred it in 1743 or 1744 to Linnæus, towards whom at that time converged all discoveries of interest in natural history. Linnæus and Dassow having written *Bufonia*, we may be allowed to believe that Sauvages wrote the name in the same manner in his correspondence.

The typical species of this genus, although (contrary to the statement of certain authors) a native of dry and sandy soil, bears an astonishing resemblance to *Juncus bufonius* of our marshes, and Linnæus may have supposed that the generic name was destined to recall this external analogy, being ignorant of the naturalist to



whom the genus was dedicated. Had Sauvages written *Buffonia*, he would have remarked that Linnæus, in his letter of the 15th of October 1745, had mis-spelt the name, and Linnæus, thus warned, would have rectified it in his letter of the 20th of August 1747. Not only is this not done, but we shall see that the Montpellier botanist himself gives an official consecration to the error, in complete disagreement with the etymology.

The 'Methodus Foliorum, seu Plantæ Floræ Monspeliensis,' a remarkably curious work, published at the Hague in 1751, gives the generic characters of *Buffonia*, followed at p. 141 by these words, "dicata illustrissimo Horti Regii Parisiensis Præfecto, et Acad. Regiæ Scient. Paris. Sodali D. de Buffon;" and by a singularity not easily to be accounted for, Sauvages prints, or allows to be printed, *Bufonia* in his text, while in the index he places *Buffonia*, without indicating that it is the correction of a mistake. More than this, after the generic name he adds an *L.*, as if Linnæus were the founder of the genus.\* Thus we have a justification for those botanists who attribute the genus *Buffonia* to Linnæus; and thus we can explain how it has happened that Linnæus, in the "legal" edition of his 'Species Plantarum,' 1764, Lamarck in 1783, in the first volume of the 'Encyclopédie Méthodique,' Gærtner in 1787, in his work 'De Fructibus\*,' Jussieu in his 'Genera Plantarum,' 1789, and a multitude of other authors, have written the name *Bufonia*, in submission to the text of Sauvages and to that of the 'Amœnitates.'

It evidently results victoriously from the preceding exposition that the alteration of the generic name *Buffonia*, by the suppression of one of the *f*'s, cannot be in any respect attributed to Linnæus, but to Sauvages himself, and thus are annihilated all assertions to the contrary, made in a multitude of books, which have found credulous readers, who perhaps were not displeased to discover in a great man, in spite of their esteem for him, what they regarded as a weakness.. Nevertheless, to render the justification, if possible, still more complete, let us admit for an instant that Linnæus was desirous of making an unworthy approximation between an illustrious adversary and a filthy animal. Every action having an object, let us ask ourselves what could be Linnæus's object in so doing? "He wished," it may be said, "to avenge himself on Buffon, who had combated his ideas of reform." Who can think thus of a man, who up to that time was ignorant even of the name of his future adversary, occupied till then only

\* Gærtner, it should be observed, spells the name with the double *ff*, quoting "*Bufonia*, L." as a synonym.—J. J. B.

with geometry, physics, and rural economy, works doubtless of some importance, as they obtained for him admission into the Academy of Sciences as early as 1733? The printing of Buffon's 'Histoire Naturelle' extended from 1749 to 1767, and it was during this interval that the reputation of Buffon was diffused and popularized. If this great man was known in Sweden prior to this epoch, it was not by Linnæus. Revenge can only be taken for an actual injury, and Linnæus had no reason to complain of attacks which had never taken place. We may here invoke a material impossibility—a sort of *alibi*. It is a petty calumny directed at one and the same time against two great names. We may consequently say with Richter (*Opera Omnia Linneana*, 1836), "Nomen iniqua mente a Linnæo in *Bufoniam* (pro *Buffonia*) mutatum esse, probent ii qui narrant."

Linnæus had his adversaries, and what man of genius has not? But in his writings we should seek in vain for traces of ill-temper. He had an elevated tone of thought, an excellent heart, and great dignity of character. He was, if I may be pardoned the expression, a very good great man. Controversy was his antipathy; he thought, not without reason, that his time was better employed in improving former publications and preparing new ones; and this was the wisest mode of reply. He not only disliked, but he feared, scientific polemics. The proofs of this assertion are as numerous as they are convincing. He answered neither Heister, nor Siegesbeck, nor Browallius, nor any other opponent. "My old friend Ludwig," he writes to Haller, "wishes to attack me, and I shall be easily conquered, for I lay down my arms beforehand. I will not defend myself." Having reason to complain of Haller, who had greatly ill-used him, he wrote thus in his 'Flora Zeylanica':—"In Germania inter Helvetos eminent alter Boerhaavius Hallerus. Cl. Hallerum esse mortalium omnium laboriosissimum, inque Theoria Medica et Anatomia hodie summum, norunt omnes. In Botanicis insuper plures investigavit et descripsit plantas quam ullus facile alius. Inique itaque dixere nonnulli me minus mite de viro optimo scripsisse; et sciant velim me ejus scripta et observationes ubique magni facere et attente volvere, cum in tota Germania vix adhuc alius meliora præstiterit."

All reformers are heated and intolerant. Linnæus was an exception; he was mild and benevolent. It has been written, and I have myself repeated it\*, that he dedicated to antagonists plants of an ungraceful habit, thorny, or singular in some of their parts. This might possibly have been so, and there would have

\* See my 'Vie de Linné,' p. 120, *et seq.*

been no great harm in it; nevertheless *Siegesbeckia orientalis*, which recalls the name of one of his most furious antagonists, is a very beautiful *Composita*; and one of the largest trees in creation is dedicated to the memory of Adanson, a reformer who wished to reform *alone*. Linnæus knew neither envy nor hatred, and showed himself satisfied with the share of esteem and of renown which he had conquered. I have said elsewhere\*, that on being made acquainted with the injurious intentions with reference to Buffon attributed to him by his enemies, he was indignant at the imputation.

And what has happened to those who attacked Linnæus? Those who founded on these attacks a hope of fame, have been forgotten; while the opposition of those whose labours have deserved well of posterity is no longer remembered; what they did for science alone remains standing. Time, that great "justicer," puts everything in its proper place, and leaves on the head of genius the imperishable crown, from which the envious have laboured in vain to tear away some of the jewels.

Buffon certainly, glorious and honoured, could have no envy towards Linnæus; but how much preferable would it have been, could he have refrained from writing against that ingenious reformer! Not only was his logic at fault, but even his science. For example, while blaming the construction of the class *Mammalia*, now universally adopted, he ought not to have said that it had been known since the time of Aristotle† that the Horse has no mammæ, and he ought not to have concluded from this that the Horse is an exception among *Mammalia*‡.

Let us go no farther; if to blame is easy, let us not forget that it has its dangerous side, and let us abstain from touching one of the greatest of our national glories. Let us be satisfied with having contributed to efface the slight spot which had been thought to tarnish the brilliancy of a justly venerated name, that of a man who by his genius has deserved to obtain the right of citizenship in every country of the civilized world.

\* 'Vie de Linné,' p. 287.

† Τα δὲ μωνύχων τὰ ἄρρενα οὐκ ἔχουσι μαστοὺς πλὴν ὅσα εἰκόασι τῇ μητρὶ, ὅπερ συμβαίνει ἐπὶ τὸν ἵππον. "In the Class of *Solipeda* the males have no mammæ, except in some individuals which resemble their mother: this is met with among horses" (Aristotle, lib. ii. 8). Thus Aristotle only says that the presence of mammæ in the Class of *Solipeda* is not universal, which, although false, is less absolute than what Buffon says.

‡ Buffon, *Histoire Naturelle*, 1749, i. p. 38 (Sur la Manière d'écrire l'*Histoire Naturelle*).

## Note on the preceding Communication.

By JOHN J. BENNETT, Esq., F.R.S., Sec. L.S.

[Read February 4th, 1858.]

SINCE the receipt of M. Fée's paper, I have carefully examined Sauvages's Letters to Linnæus, preserved among the Linnean Correspondence in the Society's Library, and have found in them several passages entirely confirmatory of M. Fée's conclusions, although they invalidate the force of some of his arguments.

The first of these passages is contained in a letter from Sauvages dated Sept. 14th, 1745, in which the learned Professor of Montpellier transcribes for Linnæus his characters of the genus "*Bufonia*, in honorem D. de Buffon, Ac. Reg. Par." In a subsequent letter, under the date of October 26th in the same year, he supplies an amended character of *Buffonia*, on which Linnæus has noted in the margin "*optime*." Sauvages adds:—"hanc mihi communicavit Medicinæ studiosus D. Marchant oculatissimus." He transmits a specimen, and adds, "*Ignosce, quæso, colendissime amice, si coram te plantam novo nomine generico indigitare ausim: hoc me judicio subjicio; tuum est mea omnia emendare.*" The Dissertation in which Linnæus first published the genus "*BUFONIA. Autore Fr. de Sauvages*" bears date June 15th, 1747, and in a letter of the date of Sept. 15th, 1747, after hearing of this publication, Sauvages has the following passage, which is conclusive as to the *animus* both of Linnæus and himself in regard to Buffon:—"Pergratum et mihi et Ill<sup>o</sup> D. de Buffon, horti Reg. Paris. Præfecto, et Academiæ Parisinæ Socio meritissimo, videbitur, quod nomen illius generi novo plantæ cujusdam inditum fuerit et sic immortalitati consecratum: cum primum hic liber [Dissertatio nempe resp. Dassow, "*Nova Plantarum Genera*"] Lutetiam appulerit, scribam ad Ill. Buffon ut tua et mea erga ipsum officia extollam." The only other reference to the subject that I can find in the Letters is under date of Sept. 13th, 1753, where, in answer to Linnæus's statement of Lœffling's observation that he found four stamina in each flower, Sauvages says, "*Bufonia* rite examinata est diandra; utrum variet inter Hispanos nescio. Mitto semina ut ipse videas." Throughout the whole of Sauvages's letters the name is spelled correctly with the double *ff*; and it is only in the body of his work that Sauvages has (inadvertently, as his index shows) adopted the erroneous spelling.

The name thus mis-spelt was published by Linnæus in 1747, and it was not until 1749, as M. Fée justly remarks, that the

offence which it has been supposed to be intended to avenge, was given to Linnæus and all other "methodists" in the preface to Buffon's great work, commenced in that year. That Sauvages at least felt this offence strongly will be seen by the following extracts from his letters; but that this feeling could not have influenced either him or Linnæus two years before the offence was given, is equally manifest. In a letter bearing date April 3rd, 1750, after referring to the attacks of Lamettrie and others, Sauvages proceeds as follows:—"Alterius certe ordinis sunt censores quos in te nuper insurgere intelligo; scil. D. Daubenton, vel de Buffon, in *Historia Naturali Universali*, quam recens edidit, et quam nondum vidi, et D. Heister in altero opusculo in quo nomenclaturæ plantarum leges novas protulit. Primus, seu D. de Buffon, quod miror maxime, omnes methodos improbat, et contendit facilius citiusque addisci historiam animalium, plantarum, &c. in individuis quam in specificis genericisque descriptionibus. Anne umquam putasses quod tam absona absurda opinio in animalis rationalis mentem venire potuisset? Hoc tamen ad me scribunt, unde non doleo quod a te recedit qui a ratione tam alienus est." And in a letter of November 15th, 1751, he continues in the same strain, referring to the Epistle to Linnæus prefixed to his own 'Methodus Foliorum,' then just published. "Videbis," he says, "quomodo paucis confutem D. Buffonem, qui existimat, mirum dictu, sine ulla methodo addiscendam esse et docendam historiam naturalem, quod certe numquam in mentem cordati hominis venerat. Malo, certe, te ab homine ita transverse cogitante carptum esse quam laudatum. Decorum etenim est illis displicere quibus ipsa ratio displicet."

The charge of mis-spelling the generic name of *Buffonia* from pique or malice having fallen completely to the ground, it may be worth while also to correct an error in regard to the specific name, to which no less an authority than that of our distinguished founder, Sir James Edward Smith, has been given in the following passage of his 'English Flora':—"Sauvages named this genus after his great countryman Buffon, who had indeed very *slender* pretensions to a botanical honour; a circumstance supposed to have been indicated by Linnæus in the specific name *tenuifolia*." A reference to the synonymy of the plant is all that is needed to show, that in this instance Linnæus simply adhered to his usual custom of adopting for his specific name, wherever practicable, a characteristic portion of the name by which it had been previously known. In this case he found a specific name admirably adapted

to the plant in the "*Alsine polygonoides tenuifolia*," &c. of Plukenet, and adopted it without hesitation.

M. Fée states the number of Linnæus's letters to Sauvages, in the possession of the Baron d'Hombre-Firmas, to be 43, commencing January 20th, 1737, and ending May 3rd, 1765. Those of Sauvages to Linnæus, in the possession of the Linnean Society, are 63 in number, commencing Sept. 10th, 1737, and terminating April 7th, 1765. From a reference to it in Sauvages's second letter, it would appear that Linnæus's first to him bears date on the 20th of *June*, and not of *January*, 1737; a mistake which might easily arise between the contracted forms of "*Jan.*" and "*Jun.*" The whole series of Sauvages's letters contains much interesting information, relating not only to the state of botanical and medical science, but also to the personal history and character of the professors of both.



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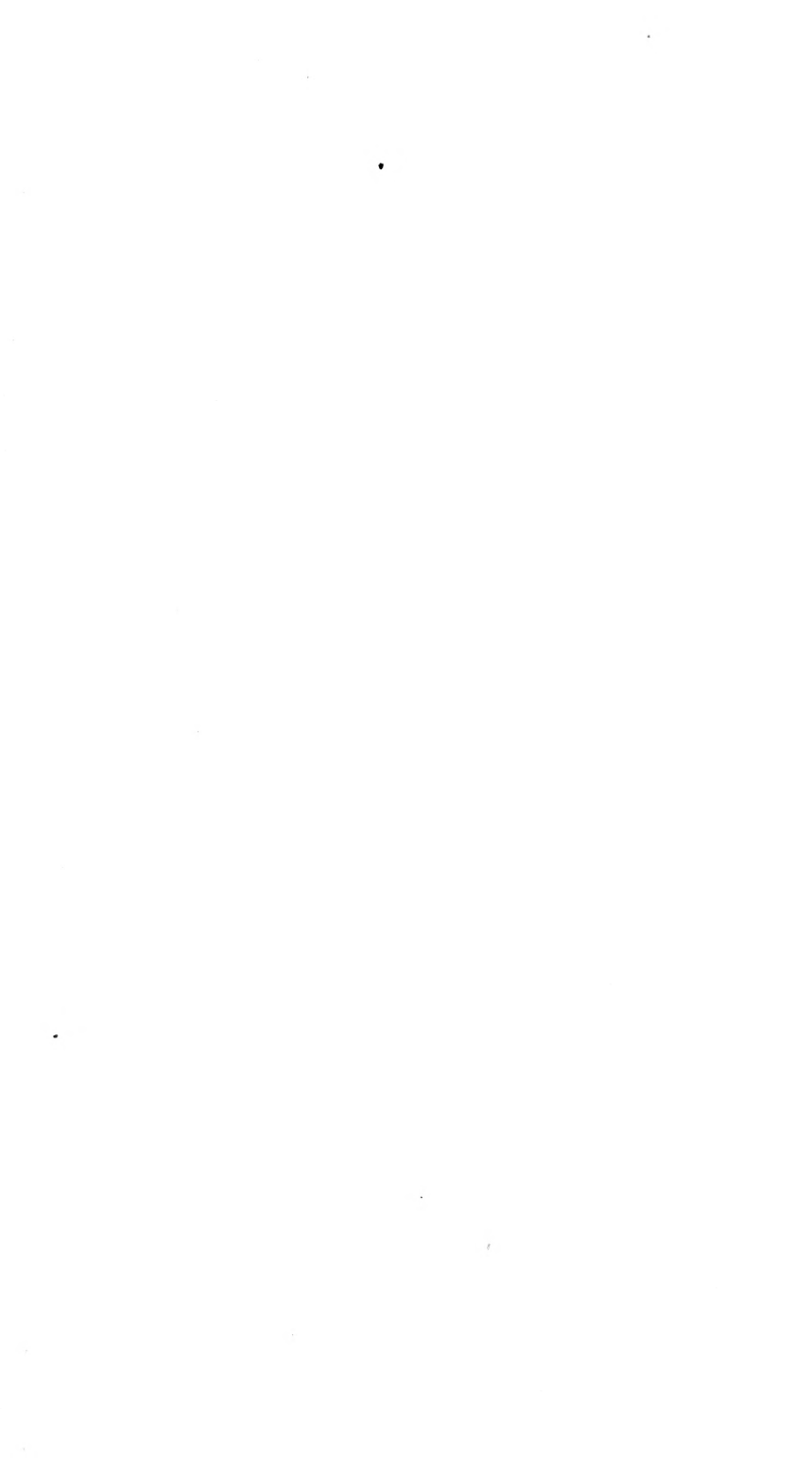


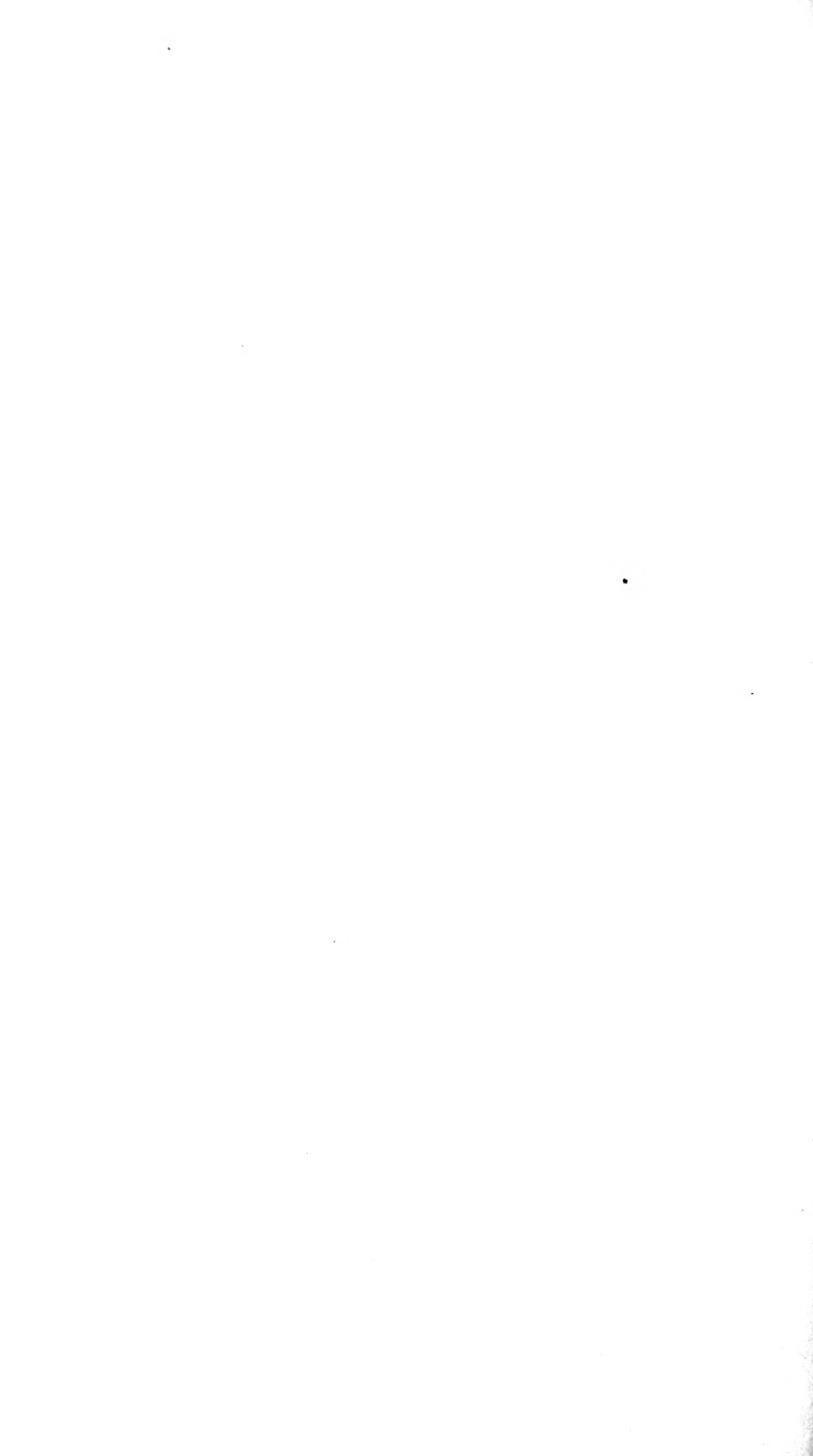
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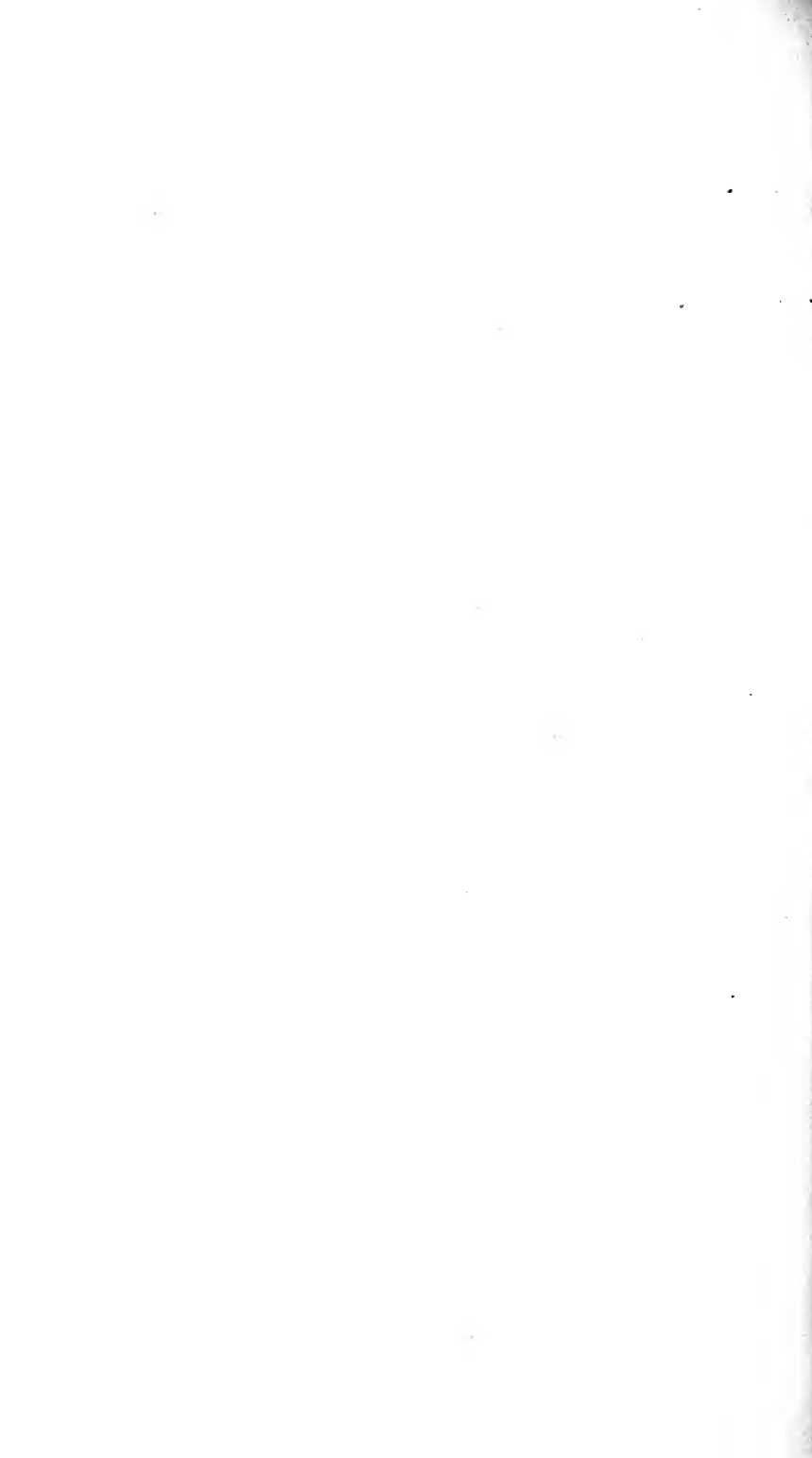












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